AF/2123 JW

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

NCR Docket No. **8320.10**

MMB Docket No. **1001-0815**

Application of: **Cash et al.**

Group Art Unit: **2123**

Serial No. **09/653,196**

Examiner: **Thomas H. Stevens**

Filed: **August 31, 2000**

For: **Lane and Front-End Effectiveness Model**

I hereby certify that this correspondence is being deposited with the United States Postal Service in an envelope addressed to: Mail Stop Appeal Brief-Patents, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on April 8, 2005
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James D. Wood
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April 8, 2005
Date of Signature

Mail Stop Appeal Brief-Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

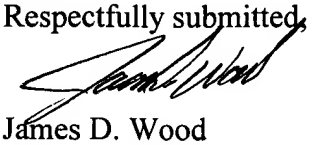
Sir:

Please find for filing in connection with the above patent application the following documents:

1. Original of the Reply Brief with Exhibits A, B, and C;
2. Three (3) copies of the Reply Brief with Exhibits A, B, and C; and
3. One (1) return post card.

Please provide any extension of time which may be necessary and charge any fees which may be due to Account No. 13-0014, but not to include any payment of issue fees.

Respectfully submitted,



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April 8, 2005
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EXHIBIT C

PTO-103P (Rev. 6-99) **PROVISIONAL APPLICATION FILING RECEIPT**

UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office
ASSISTANT SECRETARY AND COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

APPLICATION NUMBER	FILING DATE	GRP ART UNIT	FIL FEE REC'D	ATTORNEY DOCKET NO.	DRWGS	TOT CL	IND CL
60/151,629	08/31/99		$150.00	8320	20		

PAUL W MARTIN ESQ
NCR CORPORATION
101 W SCHANTZ AVENUE
DAYTON OH 45479

RECEIVED
OCT - 4 1999
LAW DEPARTMENT

Receipt is acknowledged of this Provisional Application. This Provisional Application will not be examined for patentability. Be sure to provide the PROVISIONAL APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION when inquiring about this application. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. If an error is noted on this Filing Receipt, please write to the Office of Initial Patent Examination's Customer Service Center. Please provide a copy of this Provisional Application Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts of Application" ("Missing Parts Notice") in this application, please submit any corrections to this Filing Receipt with your reply to the "Missing Parts Notice." When the PTO processes the reply to the "Missing Parts Notice," the PTO will generate another Filing Receipt incorporating the requested corrections (if appropriate). This Provisional Application will automatically be abandoned twelve (12) months after its filing date and will not be subject to revival to restore it to pending status beyond a date which is after twelve (12) months from its filing date.

Applicant(s) CHARLES R. CASH, NEW ALBANY, OH; DOUG W. POYNTER, DULUTH, GA.

IF REQUIRED, FOREIGN FILING LICENSE GRANTED 09/23/99
TITLE
MANAGEMENT DECISION MODELING SOFTWARE APPLICATIONS

DATA ENTRY BY: LOVELACE, TYWANA TEAM: 05 DATE: 09/23/99

(See reverse for new important information)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

NCR Docket No. **8320.10**

MMB Docket No. **1001-0815**

Application of: **Cash et al.** Group Art Unit: **2123**

Serial No. **09/653,196** Examiner: **Thomas H. Stevens**

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(Date of Deposit)
James D. Wood
Name of person mailing Document or Fee
Signature of person mailing Document or Fee
April 8, 2005
Date of Signature

REPLY BRIEF

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This is a reply submitted in response to the Examiner's Answer mailed on February 11, 2005. Three copies of the Reply Brief are submitted herewith.

Discussion

The Examiner has concluded that the figures in the Applicant's application (the "Applicants' figures", referred to by the Examiner as "HFE") are properly considered as prior art. The Examiner bases his conclusion on determinations that 1) the present application is not entitled to claim the priority date of the provisional application to which it claims priority and thus the Applicants' figures raise a statutory bar under 35 U.S.C. 102(b), and/or 2) the Applicants have admitted that their figures are the prior art of another under MPEP 2129.

The Examiner has failed to identify any evidence to support his determinations and, in fact, the Examiner's determinations are contrary to the available evidence. Accordingly, the Applicants' figures, which form the basis for all of the Examiner's rejections of the claims in appeal, are not available as prior art under U.S.C. 102(b) nor are they admitted prior art under MPEP 2129.

Discussion re: 35 U.S.C. 102(b)

1. The Priority Date of the Present Application is August 31, 1999

The Examiner has defended his reliance upon the Applicants' figures to reject the present claims based upon determinations made for the first time in his Answer. Based upon these determinations, the Examiner concludes that the Applicants cannot claim priority to their provisionally filed application. There is no basis for the Examiner's rejection of the claim for priority.

Specifically, the Examiner has now alleged that "the appellant's claim for priority (60/151,269) is improper due to information inconsistencies between the priority document and the application (09/653,196)."[1] (Examiner's Answer at p. 16). The Examiner has failed, however, to provide any legal basis for denying a claim to priority merely because of differences in information between a provisional application and a non-provisional application.

Contrary to the Examiner's position, there is no requirement for identity of information between a provisional application and a non-provisional application. In fact, 35 U.S.C. 112 has been interpreted to require that "the best mode contemplated by the inventor at the time of filing the application" must be disclosed. (MPEP at 608.01(h)). Accordingly, a non-provisional application is *required* to include information not provided in the provisional application to which it claims priority if there are changes in the contemplated best mode. Therefore, there is no basis for the Examiner's position.

The requirements for claiming priority in the present instance are established by 35 U.S.C. 119(e) with further requirements established in MPEP 201.11. As set forth therein, the Applicants are entitled to their claim of priority to a properly filed provisional application if (1) the later filed non-provisional application includes an invention disclosed in the provisional application, (2) the non-provisional application includes an inventor listed in the provisional application, (3) the non-provisional application is filed not later than 12 months after the date on which the provisional application was filed, (4) the non-provisional application contains or is amended to contain a specific reference to the provisional application, (5) the claim for benefit is made within four months of the

[1] The Examiner has incorrectly identified the application to which priority is claimed. The present application claims priority to U.S. Application No. 60/151,629, filed August 31, 1999.

filing of the non-provisional application, and (6) the disclosure of the invention in the provisional application was not defective.

a. An Invention Disclosed in the Provisional Application is Claimed

The present application (the " '196 application") claims an invention disclosed in the Provisional Application No. 60/151,629 (the " '629 application," (a copy of which is attached hereto as Exhibit A for the Board's convenience)). By way of example, each of the elements of claim 1 of the '196 application are set forth below followed in parenthesis by a specific page and line number and/or figure number of the '629 application wherein the element is disclosed.

Claim 1 recites:

A method of quantitatively evaluating alternatives to check-out operations using simulation model, comprising:

selecting from a data input dictionary parameters describing a first check-out operations; [page 18, line 1 through page 21 line 23 and FIG. 8)

inputting parameter values for the selected parameters describing the first check-out operations into the simulation model; [page 22 line 1 through page 26 line16 and FIGs. 9-12]

transforming the first check-out operation parameters into check-out performance results; and [page 31, lines 4 - 22 and FIGs. 25-27]

outputting the results from the simulation model [page 31 line 25 through page 33 line 5 and FIGs. 28-29].

Therefore, because every element of claim 1 of the '196 application is disclosed in the '629 application, the '196 application claims an invention disclosed in the '629 application and the first requirement is met.

b. The '196 Application and '629 Application Have the Same Inventors

With respect to the inventors for the '196 application and the '629 application, a comparison of the corrected filing receipt for the '196 application with the filing receipt for the '629 application demonstrates that there is a unity of inventors. (See filing receipts for '196 application and the '629 application, copies of which are attached hereto as Exhibits B and C, respectively). Therefore, the requirement for a common inventor is met. [2]

c. The '196 Application Was Timely Filed

The '629 application was filed on August 31, 1999. (See Exhibit C). The 196 application was filed on August 31, 2000. (See Exhibit B). August 31, 2000, is not later than 12 months after the August 31, 1999. Therefore, the '196 application was filed within the required timeframe.

d. The '196 Application Includes a Specific Claim of Priority

The '196 application was originally filed with a claim of priority. (See Specification at page 1, lines 3-6). Although the initial specification included a typographical error transposing a "2" and a "6", the error was corrected as reflected by the filing receipt shown in Exhibit B. The error was also corrected in the specification. (See Applicants' Amendment dated March 30, 2004). Therefore, the '196 application includes a specific reference to the '629 application.

[2] The filing receipts show a discrepancy as to whether "Doug" or "Douglas" is Mr. Poynter's first name or middle name; however, only one common inventor is required and Mr. Cash clearly satisfies that requirement.

e. The Claim to Priority Was Timely Made

As set forth above, the '196 application was originally filed with the claim of priority. Accordingly, the claim of priority was made within four months of the filing of the '196 application as required by MPEP 201.11.

d. The Disclosure in the '629 Application is Sufficient

The '629 application includes twenty sheets of drawings with twenty-one figures. The specification includes a discussion of the background of the invention, a summary of the invention and over thirty pages of detailed description of the invention. To a large extent, the disclosure of the '196 application mirrors the disclosure of the '629 application. The main difference is that the particular model selected from the input module for use in providing a detailed description of the disclosed embodiment is different. (See e.g. FIG. 5 et seq. of the '629 application compared to FIG. 7 et seq. of the 196 application).

Accordingly, because the two applications are so similar, and because the Examiner has never alleged that the '196 application does not adequately support its claims, it is reasonable to conclude that the disclosure in the '629 application is sufficient.

e. Conclusion

The Examiner has identified no authority for the denial of a claim to priority merely for differences in the information between applications. Moreover, as set forth above, all of the requirements for claiming priority to the '629 application have been met

for the '196 application. Therefore, the '196 application is entitled to the priority date of the '629 application. Thus, the priority date for the '196 application is August 31, 1999.

2. The Alleged Date of Publication of the Figures Does Not Raise a Statutory Bar

The Examiner has alleged that the publication date to be ascribed to the Applicants' figures is February 24, 1999. (Examiner's Answer at p. 16). As set forth above, the priority date for the present application is August 31, 1999. Therefore, because the alleged publication date is less than a year before the priority date of the present application, the Applicants' figures do not raise a statutory bar under 35 U.S.C. 102(b).

3. The Evidence Does Not Support the Examiner's Rejection

In rejecting an application, factual determinations by the USPTO must be based on a preponderance of the evidence, and legal conclusions must be correct." *In Re Glaug*, 283 F.3d 1335 (Fed. Cir. 2002)(citing *In re Oetiker,* 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992). Thus, assuming *arguendo* that the Applicants' are not entitled to their claim of priority, to be available as a publication under 35 U.S.C. 102(b), the preponderance of the evidence must show that the Applicants' figures were not only published, but also that they were published more than a year before the filing date of the '196 application. The preponderance of the evidence does not support the Examiner's determination that the Applicants' figures were published, or that they were published more than a year before the filing date of the '196 application.

a. There is No Evidence That the Applicants' Figures Were Ever Published

As an initial matter, the Federal Circuit has stated that "[a] document, to serve as a "printed publication", must be generally available." *Northern Telecom, Inc. v. Datapoint Corp.*, 908 F.2d 931, 936 (Fed. Cir. 1990). There is no evidence of any public disclosure of the Applicants' figures.

The only evidence of any disclosure of either the figures in the '629 application or the figures in the '196 application is that the figures in the '629 application were submitted to the USPTO as part of the '629 application on August 31, 1999 and that the figures in the '196 application were submitted to the USPTO as part of the '196 application on August 31, 2000. Under 37 CFR 1.14, however, applications are maintained confidential by the USPTO until some qualifying event. The Applicants' are not aware of any evidence of action by the USPTO to publish or disclose the contents of the '629 application or the '196 application.

Therefore, there is no evidence that the Applicants' figures are publications under 35 U.S.C. 102(b).

b. Any Publication by Filing Was Within One Year of the Filing

Moreover, 35 U.S.C. 102(b) requires the date of publication to have occurred more than one year prior to the filing date of the application. Therefore, even if the disclosure of the figures in the '629 application to the USPTO as part of the '629 application is considered to be a publication, the date of publication would be August 31, 1999. Therefore, because the '196 application was filed on August 31, 2000, the filing date of the '629 application does not meet the one year limitation of 35 U.S.C. 102(b).

c. There is No Evidence to Support the Alleged Publication Date

Furthermore, the date selected by the Examiner for the alleged publication of the Applicants' figures has no evidentiary support. As stated in the Appeal Brief, the publication date ascribed to the Applicants' figures by the Examiner is apparently based upon FIG. 14 of the '196 application, which includes a February 1999 date. There is, however, no indication on FIG. 14 as to the purpose of showing a February 1999 date. Significantly, FIG. 14 depicts a first page of a data input dictionary. Thus, the most reasonable meaning attributable to the February 1999 date is that the data input dictionary was last modified on that date.

Moreover, assuming *arguendo* that the Applicant's figures are reproductions of a publication, the first slide would be FIG. 4 of the '196 application, since FIG. 4 depicts a main menu for the model. (See FIG. 4). FIG. 14 of the '196 application is thus almost halfway through the alleged presentation. The date on which a presentation is given, however, is generally found on the *first* slide of the presentation, not buried midway through the presentation. This fact weighs against the February 1999 date being a publication date.

Of course, FIG. 4 of the '196 application does include a year, 1999. Nonetheless, even assuming *arguendo*, in addition to the assumption that the Applicants' figures were a publication, that FIG. 4 identified the date of the publication, there is no basis for determining that the publication was February 1999 as opposed to December 1999. Accordingly, because FIG. 4 does not identify what month of 1999 the alleged publication occurred, there is no evidence that the publication occurred before or after

August 31, 1999. Therefore, there is no evidence to support the determination that the Applicants' figures were published more than one year before the filing of the '196 application on August 31 2000.

Consequently, to the extent that there is any evidence in support of a particular date of publication, that evidence is competent only for indicating the year 1999. There is no evidence, however, that supports any particular month of 1999. Therefore, the preponderance of the evidence does not support a determination that the Applicants' figures were published more than one year prior to the filing of the '196 application.

d. Conclusion

Therefore, for any or all of the above reasons, even assuming *arguendo* that the Applicants' are not entitled to their claim of priority, the preponderance of the evidence does not support the Examiner's determination that the Applicants' figures were published or were published more than a year before the filing date of the '196 application so as to raise a statutory bar under 35 U.S.C. 102(b).[3]

Discussion re: MPEP 2129

The Examiner has also concluded that reliance on the Applicants' figures to reject the claims in the present application is supported by MPEP 2129. In support of this conclusion, the Examiner has stated that the Applicants' figures "appear to be analogous to a Power Point presentation – thus appearing as a stand alone document—with no one

[3] Of course, given the dearth of evidence supporting the Examiner's positions newly presented in his Answer, it is puzzling that a request for information under 37 CFR 1.105 as discussed in the MPEP at 704.10 was not made so as to enable a proper determination of the facts.

(sic) disclosure of credit to either assignee or appellant." (Examiner's Answer at page 16). The Examiner's reliance upon MPEP 2129 is unfounded.

1. The Applicant Has Never Identified the Figures as Prior Art

The phrasing used by the Examiner suggests that the Examiner is relying upon the statement in MPEP 2129 that "the examiner must determine whether the subject matter identified as "prior art" is applicant's own work, or the work of another. In the absence of another credible explanation, examiners should treat such subject matter as the work of another." The Examiner has ignored, however, that the "prior art" must be identified as such by the *applicant*, not by the Examiner.

Specifically, MPEP 2129 states that "[a] statement by an applicant during prosecution identifying the work of another as "prior art" is an admission that that work is available as prior art against the claims, regardless of whether the admitted prior art would otherwise qualify as prior art under the statutory categories of 35 U.S.C. 102." (MPEP 2129 citing to *Riverwood Int'l Corp. v. R.A. Jones & Co.*, 324 F.3d 1346, 1354, 66 USPQ2d 1331, 1337 (Fed Cir. 2003)(emphasis in original)). Thus, it is only once an applicant admits that something is prior art that any presumption of non-attribution is allowed. The applicant has never identified the Applicants' figures as prior art.

As an initial matter, the figures do not bear any marking that they are prior art. Additionally, the '629 application includes a background section that is included in the background section of the '196 application. Neither background section identifies the accompanying figures as prior art. Moreover, the brief description of the drawings in both inventions identifies the accompanying figures as illustrating the "present

invention". Finally, a review of the Applicants' amendments and Appeal Brief did not identify any admission by the Applicant that the Applicant's figures were prior art.

Therefore, there is no basis for a determination that the Applicants have identified the Applicants' figures as prior art in the '196 application, the '629 application, or at any time during prosecution of the '196 application.

2. The Replacement Drawings Were Properly Identified

The intent of the Examiner in analogizing Applicants' figures to a power point presentation is not clear. To the extent that the Examiner intended to state that the replacement drawings were submitted without any indication as to what they were, the Examiner is mistaken.

In the Amendment dated March 30, 2004, the amendment clearly states that replacement drawings were included. Moreover, the transmittal letter identified the contents of the package as replacement drawings. Therefore, there can be no confusion as to whether or not the replacement drawings were intended to be replacement drawings or an unidentified and unacknowledged submission of prior art.[4] The replacement drawings were clearly identified as replacement drawings.

3. The Appearance of Figures Does Not Constitute an Admission

Of course, the Examiner does emphasize the appearance of the Applicant' figures, as he noted that they "*appear* to be analogous to a Power Point presentation – thus *appearing* as a stand alone document". (Answer at page 16 (emphasis added)). Thus, the

[4] The post card identifying the contents of the package including the replacement drawings and mailed by the PTO does not identify any figures or presentations in addition to the identified replacement drawings.

Examiner may have been attempting to state that the *look* of the Applicants' figures raises a presumption that the Applicants admit that their figures are prior art under MPEP 2129. The Examiner has failed to identify any legal basis for such a conclusion.

As an initial matter, there is nothing in MPEP 2129 that discusses how the *look* of a figure provides a basis for determining that an applicant is making a prior art admission. Rather, MPEP 2129 appears to be rather clear in restricting the scope of admissions to actual statements.

Moreover, the Examiner's rationale requires a presumption that if the figures submitted in support of the disclosure of an invention resemble figures that can be produced using commercially available presentation software, then there is a presumption that the figures are in fact reproductions of presentation slides. Of course, virtually any image may be readily reproduced using commercially available presentation software. Accordingly, under the Examiner's rationale, *all* figures submitted to the USPTO as part of a patent application are presumably reproductions of presentation slides. The Applicants are not aware of any legal basis for such a presumption and the Examiner has failed to identify any such legal basis.

Moreover, there must also be a presumption that all figures filed with an application were actually presented to an audience in a manner sufficient to constitute a "publication". Again, the Applicants are not aware of any legal basis for such a presumption and the Examiner has failed to identify any such legal basis.

In fact, the MPEP suggests that there is no presumption that figures submitted with an application are reproductions of prior art publications. For example, the MPEP 608.02(g) states that "[f]igures showing the prior art are usually unnecessary and should

be canceled. *Ex parte Elliott*, 1904 C.D. 103, 109 O.G. 1337 (Comm'r Pat. 1904). However, where needed to understand applicant's invention, they may be retained if designated by a legend such as "Prior Art."" Obviously, there would be no need to label figures as prior art if all figures were presumed to be prior art.

Therefore, there is no basis for concluding that figures submitted with a patent application are admitted to be prior art by the applicant based solely upon the appearance of the figures.

4. Conclusion

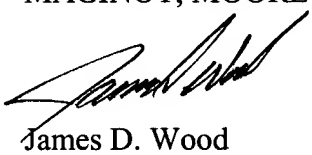
Therefore, for any or all of the above reasons, the preponderance of the evidence does not support the Examiner's new conclusion that the Applicants' figures are admitted prior art under MPEP 2129.[5]

[5] Interestingly, during the time the '196 application was being examined, the Examiner never suggested that the Applicants' figures needed to be corrected by either canceling the Applicants' figures or by amending them to state that they were prior art as required by the MPEP 608.02(g). Thus, the Examiner's own actions contradict his newly formed determination that the Applicants' figures are admitted prior art under MPEP 2129.

Conclusion

For the reasons set forth above, the Applicants' figures are not properly considered as prior art. Therefore, for all of the reasons set forth in the Applicants' Appeal Brief, claims 1, 3-18 and 20-31 are not unpatentable under 35 U.S.C. § 103(a). As a consequence, the Board of Appeals is respectfully requested to reverse the rejection of these claims.

Respectfully submitted,
MAGINOT, MOORE & BECK LLP



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April 8, 2005

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Exhibit A

PROVISIONAL APPLICATION COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION under 37 CFR 1.53(c).

		Docket Number	8320	Type a plus sign (+) inside this box →	+

INVENTOR(s)/APPLICANT(s)			
LAST NAME	FIRST NAME	MIDDLE INITIAL	RESIDENCE (CITY AND EITHER STATE OR FOREIGN COUNTRY)
Cash Poynter	Charles Doug	R. W.	New Albany, Ohio Duluth, Georgia

TITLE OF THE INVENTION (280 characters max)

MANAGEMENT DECISION MODELING SOFTWARE APPLICATIONS

CORRESPONDENCE ADDRESS

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NCR Corporation
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Dayton, OH 45479
(937) 445-8394

STATE	Ohio	ZIP CODE	45479	COUNTRY	USA

ENCLOSED APPLICATION PARTS *(check all that apply)*

[x]	Specification	*Number of pages* [38]	[ ]	Small Entity Statement
[X]	Drawings	*Number of sheets* [20]	[x]	Other (specify): Attachments A-G and Appendices A-B

METHOD OF PAYMENT *(check one)*

[X]	A check or money order is enclosed to cover the Provisional filing fees	PROVISIONAL FILING FEE AMOUNT ($) 150.00	
[x]	The Commissioner is hereby authorized to charge filing fees and credit Deposit Account Number: 07-1337		

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

[X] No.

[ ] Yes, the name of the U.S. Government agency and the Government contract number are: _____

_____

[ ] Additional inventors are being named on separately numbered sheets attached hereto.

Respectfully submitted,

LOWE HAUPTMAN GOPSTEIN GILMAN & BERNER, LLP

Kenneth M. Berner

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Date: August 31, 1999

Facsimile: 703-518-5499

Docket No. 8320

MANAGEMENT DECISION MODELING SOFTWARE APPLICATIONS

Field of the Invention

The present invention relates generally to computer software for solving complex business problems, and more particularly, to Management Decision Models (MDM) to assist decision-makers in addressing complex business problems that are quantitatively difficult to solve. The purpose of MDM is to provide an approach to reduce time, risk and uncertainties of investing in new technologies or design changes by predicting the impact of these new technologies before committing to implementation.

Background of the Invention

Management Decision Models (MDM) are a class of software applications providing decision-makers with new information about their business that help decision-makers address key business issues. MDM are flexible, data driven, software tools used to predict the effect of process, design, or technology changes on productivity and other business performance measures, as well as the financial impact of such changes. MDM may be customized to address questions relating to any business domain, including product manufacturing, service industry, and retail operations (e.g., grocery front-ends, convenience stores). MDM have graphical user interfaces. Components of a MDM include 1) a database management module to maintain the application's input data parameters and output data performance measures; 2) a simulation engine to represent the dynamic interaction between the elements of a system, such as, the people, equipment. material, information and energy; 3) animation to visualize how the system reacts to changes in input parameters; 4) an environmental design layout

module for calculating physical space requirements to accommodate new equipment or process changes; and 5) a financial module which transforms operational performance measures into financial metrics including Return on Investment (ROI).

The output from a MDM indicates the predicted performance of the system using metrics that are the most meaningful to the decision-maker. The output includes operational performance measures, such as, queuing times or sizes, equipment utilization, number of stock-outs, and customer system times as well as financial metrics, such as ROI, Not Present Value (NPV), and payback.

Summary of the Invention

MDM are a class of decision support software applications for assisting business management in making strategic business decisions. MDM address business problems in a unique way. MDM are flexible, data driven, and integrated software tools. MDM are flexible, so a user can address an unlimited number of issues relating to specific domain applications. MDM are data driven, so a user can customize a model to a particular problem by entering the appropriate values into the input data parameters. MDM are integrated, so a user can apply one or more components of the tool to address business questions. Another key concept about MDM is that MDM are designed to be usable by individuals that are knowledgeable about the application domain and not necessarily knowledgeable about the tool's methodology. In summary, MDM provide a structured, quantitative approach to address business issues and help companies profitably manage and grow their business.

An example of an MDM application is a Branch Effectiveness model (BEM). The BEM is a self-contained PC desktop application that allows a bank analyst to quantitatively analyze changes to their branch environments. The BEM uses simulation to mimic the complex interactions between customers and bank resources in three branch environments: Customer Service, Self Service, and

Retail Service. The purpose of the model used in the present invention is to provide banks with a method to reduce the risk and uncertainties of investing in new technologies or design changes by predicting their impact and return before committing resources to their acquisition or implementation.

Still other objects and advantages of the present invention will become readily apparent to those skilled in the art from the following detailed description, wherein the preferred embodiments of the invention are shown and described, simply by way of illustration of the best mode contemplated of carrying out the invention. As will be realized, the invention is capable of other and different embodiments and its several details are capable of modifications in various obvious respects, all without departing from the invention. Accordingly, the drawings and description thereof are to be regarded as illustrative in nature, and not as restrictive.

Brief Description of the Drawings

The present invention is illustrated by way of example, and not by limitation, in the figures of the accompanying drawings, wherein elements having the same reference numeral designations represent like elements throughout and wherein:

Figure 1 is a high level block diagram of a computer system usable with the present invention;

Figure 1A is a high level logical architecture of an MDM according to the present invention;

Figures 1B and 1C are flow diagrams for an MDM model according to the present invention;

Figure 2 is a flow diagram over viewing a customer engagement process;

Figure 3 is a flow diagram over viewing a modeling process;

Figure 4 depicts a Branch Effectiveness Model main menu form;

Figure 5 depicts a Branch Effectiveness Model input module form;

Figure 6 depicts a Create Parameter File form;

Figure 7 depicts an input module form after creating Scenario Casel;

Figure 8 depicts Edit Parameter File form;

Figure 9 depicts an Arrival Rate Schedule form;

Figure 10 depicts a Customer Decision Matrix Edit form;

Figure 11 depicts a Self Service and Operator Assisted Balk Probabilities Edit form;

Figure 12 depicts a Personnel Schedule Edit form;

Figure 13 depicts a Counter Transaction Type Probabilities Edit form;

Figure 14 depicts a Counter Transaction Times Parameter 1 Edit form;

Figure 15 depicts a Delete Parameter File form;

Figure 16 depicts a Print Scenario Data Input Dictionary Report for the Self Service Branch Model;

Figure 17 depicts a Run Simulation Module form;

Figure 18 depicts an Animation Overview Screen for the Self Service Branch Model;

Figure 19 depicts a Main Menu Screen for the Self Service Branch in Animation Mode;

Figure 20 depicts a Self Service Branch Model Description Screen in Animation Mode;

Figure 21 depicts a Self Service Branch Output Statistics Screen in Animation Mode;

Figure 22 depicts a Self Service Branch Input Values Screen in Animation Mode;

Figure 23 depicts a Self Service Branch Plot of Number of Customers in the Branch Screen in Animation Mode;

Figure 24 depicts an Animation Overview Screen for Customer Service Bank Model;

Figure 25 depicts an Animation Overview Screen for Retail Store Branch Model;

Figure 26 depicts running a Model Scenario in Analysis Mode;

Figure 27 depicts completing a Model Scenario in Analysis Mode;

Figure 28 depicts an Output Module form; and

Figure 29 depicts Performance Statistics Report for the Self Service Branch.

Best Mode for Carrying Out the Invention

A method and apparatus for information discovery and visualization are described. In the following description, for purposes of explanation, numerous specific details are set forth in order to provide a thorough understanding of the present invention. It will be apparent, however, that the present invention may be practiced without these specific details. In other instances, well-known structures and devices are shown in block diagram form in order to avoid unnecessarily obscuring the present invention.

Hardware Overview

Figure 1 is a block diagram illustrating an exemplary computer system 100 upon which an embodiment of the invention may be implemented. The present invention is usable with currently available personal computers, mini-mainframes and the like. The computer system 100 can be a "presence" as described below.

Computer system 100 includes a bus 102 or other communication mechanism for communicating information, and a processor 104 coupled with the bus 102 for processing information. Computer system 100 also includes a main memory 106, such as a random access memory (RAM) or other dynamic storage device, coupled to the bus 102 for storing information and instructions to be executed by processor 104. Main memory 106 also may be used for storing

temporary variables or other intermediate information during execution of instructions to be executed by processor 104. Computer system 100 further includes a read only memory (ROM) 108 or other static storage device coupled to the bus 102 for storing static information and instructions for the processor 104. A storage device 110, such as a magnetic disk or optical disk, is provided and coupled to the bus 102 for storing information and instructions.

Computer system 100 may be coupled via the bus 102 to a display 112, such as a cathode ray tube (CRT) or a flat panel display, for displaying information to a computer user. An input device 114, including alphanumeric and other keys, is coupled to the bus 102 for communicating information and command selections to the processor 104. Another type of user input device is cursor control 116, such as a mouse, a trackball, or cursor direction keys for communicating direction information and command selections to processor 104 and for controlling cursor movement on the display 112. This input device typically has two degrees of freedom in two axes, a first axis (e.g., x) and a second axis (e.g.,) allowing the device to specify positions in a plane.

The invention is related to the use of a computer system 100, such as the illustrated system, to display a branch effectiveness model. According to one embodiment of the invention, the branch effectiveness model and display is provided by computer system 100 in response to processor 104 executing sequences of instructions contained in main memory 106. Such instructions may be read into main memory 106 from another computer-readable medium, such as storage device 110. However, the computer-readable medium is not limited to devices such as storage device 110. For example, the computer-readable medium may include a floppy disk, a flexible disk, hard disk, magnetic tape, or any other magnetic medium, a CD-ROM, any other optical medium, punch cards, paper tape, any other physical medium with patterns of holes, a RAM, a PROM, an EPROM, a FLASH-EPROM, any other memory chip or cartridge, a carrier wave embodied in an electrical, electromagnetic, infrared, or optical signal, or any other

medium from which a computer can read. Execution of the sequences of instructions contained in the main memory 106 causes the processor 104 to perform the process steps described below. In alternative embodiments, hard-wired circuitry may be used in place of or in combination with computer software instructions to implement the invention. Thus, embodiments of the invention are not limited to any specific combination of hardware circuitry and software.

Computer system 100 also includes a communication interface 118 coupled to the bus 102. Communication interface 108 provides a two-way data communication as is known. For example, communication interface 118 may be an integrated services digital network (ISDN) card or a modem to provide a data communication connection to a corresponding type of telephone line. As another example, communication interface 118 may be a local area network (LAN) card to provide a data communication connection to a compatible LAN. In the preferred embodiment communication interface 118 is coupled to a virtual blackboard. Wireless links may also be implemented. In any such implementation, communication interface 118 sends and receives electrical, electromagnetic or optical signals which carry digital data streams representing various types of information. Of particular note, the communications through interface 118 may permit transmission or receipt of data used in the branch effectiveness model. For example, two or more computer systems 100 may be networked together in a conventional manner with each using the communication interface 118.

Network link 120 typically provides data communication through one or more networks to other data devices. For example, network link 120 may provide a connection through local network 122 to a host computer 124 or to data equipment operated by an Internet Service Provider (ISP) 126. ISP 126 in turn provides data communication services through the world wide packet data communication services through the world wide packet data communication network now commonly referred to as the "Internet" 128. Local network 122 and

Internet 128 both use electrical, electromagnetic or optical signals which carry digital data streams. The signals through the various networks and the signals on network link 120 and through communication interface 118, which carry the digital data to and from computer system 100, are exemplary forms of carrier waves transporting the information.

Computer system 100 can send messages and receive data, including program code, through the network(s), network link 120 and communication interface 118. In the Internet example, a server 130 might transmit a requested code for an application program through Internet 128, ISP 126, local network 122 and communication interface 118. In accordance with the invention, one such downloaded application provides for input and output of data and parameters as described herein.

The received code may be executed by processor 104 as it is received, and/or stored in storage device 110, or other non-volatile storage for later execution. In this manner, computer system 100 may obtain application code in the form of a carrier wave.

Management Decision Modeling Applications

Management decision modeling applications are called MDMs. An MDM is comprised of a set of different objects or modules that are integrated together to provide new information to a decision maker on how to improve or manage a retail or financial service point system at points of transactions between the customer and the operation or the system. Examples of MDMs include modeling of a grocery store checkout, a bank branch and a post office. MDMs are flexible, data driven, integrated applications. The analyst that uses the tool would customize a specific MDM application to a customer's environment by specifying the input parameter values.

As depicted in Figure 1A, an MDM 160 is comprised of six or more different modules. The first module is a database manager module 170 or just a

database engine. The database manager module 170 has all the functionality of any other database. The User can create data files, add data files, edit data files, modify data files, delete data files, and print data files. Microsoft Access can be used as the database engine 170. The second module is a simulation engine 172 which, for example, can be Arena Simulation Software available from Systems Modeling Corporation. Simulation is a well known methodology. Simulation is used for capturing the dynamic interactions between the entities and resources within a particular system. The simulation engine 172 contains all the logic that mimics the real life system represented. So, for example, the simulation engine 172 can model a detailed dynamic sequence of steps in the process of a customer checking out of a grocery store including the steps of having the customer pick an item out of the customer's basket, putting the item on the front belt and having the item move down the belt, the cashier picking the item up, entering it via scanner or keyboard, and placing the item on the back belt. All the logic and how it would be conceptualized is all embedded into the simulation model. In any particular MDM application, it might be multiple types of simulations. In fact, each one developed thus far has multiple simulation models representing site variations of the particular domain of that application. The simulation models are the essence of logic of the system that the MDM model represents.

The third module is called the animation module 174 that allows the User to visualize what the logic is embodied in the simulation model 172. The animation module 174 provides a visual two dimensional view of the system that simulation represents and it shows the movement of various icons corresponding to the customers, resources, check stands or ATMs, etc. The software being used for the animation module 174 is available from Systems Modeling Corporation.

An environmental design layout module 176 is used to layout the various resources used in simulating in modeling a grocery store check out counter, a bank branch checkout counter and the like.

A financial module 178 is used to determine the financial impact of changing the resources used in the simulation.

A quick assessment module 180 is used to quickly provide an overview to the User of the impact of making changes to the resources used in the simulation.

Referring now to Figure 1B, a flow diagram illustrating an overview of the MDM process according to the present invention is depicted. At step 1000 the process is started. At step 1010, an MDM application is selected. At step 1012 an application module is chosen. At step 1014 a model is selected. At step 1016 an existing scenario is either created or selected. At step 1018 one or more parameter values are entered. At step 1020 a model with scenario is evoked. At step 1022 the output is either viewed, printed or saved. At step 1024 it is decided whether to repeat the steps of 1012-1022. If the determination of step 1024 is yes, then the application loops back to either step 1012 or step 1014. If the determination of step 1024 is no, then the process is completed at step 1026.

Figure 1C is a more detailed flow diagram of step 1010 in Figure 1B. At step 1100 the process is started. At step 1110 an application module is selected. if no application module is selected, then at step 1112 the process is ended. From step 1110 the User can select either a quick assessment module 1112 or a design layout module 1114. From module 1112 a QA report 1116 can be generated or an input module 1118 can be selected. The quick assessment module 1112, the design layout module 1114 and the input module 1118 all access an application database 1130. A simulation module 1140 interacts with the input module 1118. The simulation module 1140 can be used to generate a simulation report 1142. A financial module 1150 interfaces with the input module 1118 and the application module 1110. The financial module 1150 can be used to generate a financial report 1152. Both the simulation module 1140 and the financial module 1150 access the application database 1130.

Referring now to Figure 2, an overview of a customer engagement process is depicted. At step 210 business issues are identified. At step 220 the questions

are specified that have to be answered. At step 230 data requirements are determined. At step 240 data is collected. At step 250 modeling techniques are used to transform data into information. At step 260 the User answers questions and makes recommendations based upon the output of the modeling techniques. At step 210 the process can be continued in a circular fashion until the modeling technique is completed. The Figure 2 diagram is an overview of the MDM process.

Figure 3 is an overview of the modeling process used in Figure 2 and more specifically the modeling technique of step 250 in Figure 2. The modeling process must be validated and creditability established for the modeling process to be effective. First assumptions must be made to be placed into the conceptual model 310. The output from the conceptual model is input into a mathematical model 320 which includes approximations. The mathematical model is exercised and outcomes are predicted by checking the mathematical model against the real systems bank branch. Data is collected and the bank branch is observed to validate and establish credibility for the mathematical model.

The BEM Application

The BEM application provides a bank analyst with a tool that can predict their impact of moving from predominately counter based services to self-service in a bank branch. As described herein in Figures 4-29, a user guide is described instructing a user for using the BEM application. The BEM application is included herein as Attachments as follows: Attachment A entitled "SSBModel" (pp. 1-112); Attachment B entitled "RSBModel" (pp. 1-94); Attachment C entitled "CSBModel" (pp. 1-68); and Attachment D entitled "BEMApp. (pp. 1-55). An analyst may use the BEM to identify and recommend alternative business methods that affect:

- Productivity
- Customer service

- Operating costs, and
- Overall profitability.

These improvements may result from more efficient labor scheduling, number and location of customer service points, or refinements in branch design and layout.

The BEM application provides a Graphical User Interface (GUI) that allows a user to:

- Input and manage data that characterizes a particular branch;
- Select and run one of the corresponding simulation models; and
- View and write the simulation results to a file or printer.

The BEM application represents three different types of branch environment: Customer Service, Self Service, and Retail Service. The following list of characteristics describes these three environments:

Customer Service Branch (CSB)

- prime high street locations
- current account based, routine transactions
- counter service based
- no back office functions
- 5-20 staff, depending on location'
- typical banking hours, 9am-3pm, Monday to Friday, maybe Saturday
- high cost of delivering customer service

Self Service Branch (SSB)

- increasing availability of customer service, 24 hours
- extend customer offerings
- migration from counter services to self service
- no back office functions
- new outlet locations, e.g., shopping malls
- reduced staff manning

- meeter/greeter staff role only
- no formal meeting rooms
- lower cost of delivering service

Retail Service Branch (RSB)

- more aggressive "retail" approach
- enhanced customer experience
- building "foot flow"
- softer, more informal environmental design
- staff emphasis on selling and promotion
- 4 to 6 staff typically

The BEM application simulates bank operations for a user-defined planning period (e.g., a day) by representing customer demands service requirements, bank automated resources, travel distances, staffing schedules, and other bank procedures for each of the three branch types. Each branch type consists of a configuration of service points. The following table shows the service points for each branch type and whether the branch type requires operator assistance.

Module Type	CSB	SSB	RSB	Staff
ATM – cash only (Fast Cash)	Yes	Yes	Yes	No
ATM – cash, balance, statements, deposits (Multi ATM)	Yes	Yes	Yes	No
ATM – general	Yes	Yes	Yes	No
Deposits – personal (automated)	Yes	Yes	Yes	No
Deposits – business (automated)	Yes	Yes	Yes	No
Deposits – Postbox	Yes	Yes	Yes	No
Change machine	No	Yes	Yes	No
Kiosk Bank only	No	Yes	Yes	No
Kiosk Other	No	Yes	Yes	No
Writing Desk	Yes	Yes	Yes	No
Telephones	No	Yes	Yes	No
Reception desk	Yes	Yes	Yes	Yes
Meeting room – enclosed	Yes	No	Yes	Yes
Cashier counter positions	Yes	No	No	Yes

Excluded from the BEM module are branch back office functions. The BEM module does not represent staff requirements to carry out any form of service on self service module types, e.g., periodically empty envelopes from a deposit machine.

The BEM module includes Input, Run Simulation and Output Modules.

The Input module allows the User to create and manage input data scenarios that characterize the configuration and logic in a simulation model. For example, the User may specify the number of tellers or ATM machines, service times or service operations, customer arrival patterns or service requirements. The Data Input Dictionary (DID) for each simulation model lists and defines the parameters used in each model. Appendix A contains the DID reports for each model.

The Run Simulation Module allows the User to select one of the three simulation models and an input data parameter file that defines the scenario the User wants to analyze. Each of the simulation models can run in two modes: Demo and Analysis. The Demo mode for a simulation has the animation turned on; the Analysis mode has the animation turned off. With the animation off, the models execute much faster allowing the User to conduct more statistically sound experiments and evaluate more scenarios in a shorter time period. A model with the animation turned on is more effective for understanding and communicating the model's results. In many cases the animation provides a visual check that the model is running the way the User expects. There are also several screen views that provide additional insight when the model is run with animation.

The Output Module allows the User to view and write results after running a simulation model to a file or printer. The performance measures calculated by each model include queue size, queue time, dwell time, transaction counts, and utilization for all service points in the scenario. The models also outputs bank level measures such as number and time a customer spends in the bank, total number of customers and transactions processed, balking, and labor times.

The BEM module is a powerful analysis tool that can help a bank analyst design, manage, and improve a branch's configuration and operations. The model predicts the operational impact of changes to a branch environment thereby allowing the bank to reduce the time, uncertainty, and risk when making these types of business decisions.

As used herein, the following conventions are used to describe screens, their objects and user operations. A full screen window is referred to as a form. The form's title is used to reference the window. The button options of a form are referenced using **bold** letters and file names in *Italics*. We also use the phase "click" or "select" interchangeably to describe the User operation of evoking a form's option using a mouse or other point device.

Figure 4 is a display of the Main Menu of the BEM module. From this form, the User can enter an Input Module 410, a Run Simulation Module 420 or Output Module 430 by selecting the corresponding button with their mouse or other pointing device.

When finished, the User closes the BEM application by selecting a Quit Application button 440. This is the only form that has the Quit Application 440 button, so the User must return to the Main Menu to close the BEM tool.

Figure 5 depicts an input module form 500. The Input Module form depicted in Figure 5 allows the User to create, save, edit, delete and print input parameter files that specify model scenarios. The User can also run a simulation scenario with and without animation from the input module form 500. The User can perform these operations by first selecting the type of model they wish to run in a Models table 510. After choosing the simulation model, the Scenarios table 530 will display the scenarios files available for that model. The Models table includes the previously described Self Service Branch Model 1 512, a Counter Service Branch Model 1 514 and a Retail Service Branch Model 1 516. Each simulation model has its own set of input parameter files. The User may then select the input parameter file the User wants to work with (i.e., edit, delete, print or run). To select a model or scenario, the User clicks in the Model or 512, 514, 516 or scenario name field 532 or on the small rectangle area of the left of these fields 522, 524, 526 and 542, respectively.

Figure 5 shows the selection of the Self Service Branch Model 512 and the Default scenario 532. The User does not have to select a scenario before selecting the Create Scenarios button 550. The User will have the opportunity to select a scenario from which to create a new scenario on a Create Parameter File form 600 discussed below. If the User wants to run a simulation model with animation, check (i.e., click the left button on your mouse while positioned over the check box 85) the Animation box 585 before selecting the Run Simulation button 580.

When installed on the computer system 100, the BEM module includes on Default scenario for each simulation model. The values in the Default scenarios are from industry composite data collected.

Appendix A provides a list of the parameter values in the default scenarios.

The User can create a new scenario file by selecting the Create Scenario button 550 from the Input Module 410.

Figure 6 depicts the Create Parameter File form 600. To create a scenario, the User selects the existing file that the User wants to use to crate the new file from in the list of scenarios in the center of the Create Parameter File form 600. A parameter file scroll bar (not shown) will display to the right of the list when there are more than four scenarios for a model. A name for a new scenario is entered by positioning the cursor in the Scenario Name field 620 and using the keyboard number to type in the name. The BEM module does not allow duplicate scenario names for a simulation model. The Scenario Name field 620 can be up to 30 characters (including blank spaces). The User can also enter an optional Scenario Description of up to 55 characters to further describe the parameter file.

After entering the Scenario Name in a Scenario name field 620 and optional description in a Scenario Description field 630, the User should select a Create and Return button 610 (or press Alt-C) to create the scenario file. The application will prompt the User to confirm their selection before returning to the Input Module form 500. Figure 6 illustrates the scenario file called Case 1 will be created by this process. The other option one could take from this form is a Return Without Creating button 615 that returns the User to the Input Module form 500 without creating a file. The scenario tables 530 is displayed listing scenario names and scenario descriptions available to be cloned.

Figure 7 depicts the Input Module form after the creation of scenario Case 1 750. A scroll bar (not shown) will display to the right of the Scenarios list when there are more than eight scenarios for a model.

Each of the simulation models in the BEM application has its own set of data parameters the User can control to create a scenario. A model's Data Input Dictionary (DID) defines the model's input parameters and their properties, i.e., parameter values, ranges, and what each parameter controls in a model scenario. The User can view or print a model's DID using a Print Scenario button 575 from the Input Module form 500 (or edit forms for non-scalar parameters). The DID provides the following information for each parameter.

Parameter: The parameter column provides a brief description of how the model uses the input parameter data. If the parameter field contains the word "ARRAY" it means that it has more than one value assigned to it. For example, the User can enter up to 96 values for the parameter representing the expected number of arrivals per hour in 15-minute time intervals for a 24-hour day.

Value: The value column displays the current data value assigned to each parameter. A parameter with more than one value will not display a value in this field, i.e., the field is blank. Parameters of this type are edited using an additional edit form.

Range: The range column defines the range of values and the units for the parameter.

Description: The description column provides a more detailed description of the parameter and its use in the model.

The following table shows the number of parameters and values under the control of the User for each of the BEM models.

Simulation Model	Number of Parameters	Number of Values
Customer Service Branch Model	59	458
Self Service Branch Model	66	409
Retail Service Branch Model	70	489

The parameters for each model are divided into five categories to make them easier to learn and easier to change their values. The eight categories are as follows:

1. Configuration
2. Customer Demand and Routing
3. Labor Schedules
4. Transaction Characteristics
5. Simulation Model Parameters

The Configuration category contains parameters that define the length and resources in a scenario, e.g., the number and type of ATMs, etc. The length of a scenario for any of the models can be up to 24 hours.

The Customer Demand and Routing category has parameters that specify the expected number of customer arrivals (i.e., footfalls) by time of day, customer routing between service points within a branch, and balking criteria. The BEM module uses a random sampling process (non-homogeneous Poisson arrival process) to generate the arrival times and another random sampling process to determine the sequence of service points a customer visits once they enter the branch. The User controls how many customers arrive and their routing within the bank using the arrival rate and customer decision matrix parameters.

Parameters in the Schedules category for the BEM module allow the User to enter Tellers, Platform personnel, and Meeter-Greeter schedules in 30-minute intervals during a scenario.

The Transaction Characteristics category contains parameters that govern the dwell time parameters by resource type and the number of transactions per customer visit per resource by resource type. The dwell time at a resource is defined as the time interval between when a customer initiates a service request

and until they depart the resource. It should be noted that a customer's dwell time is not necessarily the same as the transaction time at a resource because a customer may perform more than one transaction at a service point per visit.

For most dwell time events, the User needs to enter two parameter values. In the BEM module, the first parameter specifies the mean and the second parameter specifies the standard deviation of the event time distribution. For example, in the default scenarios for SSB, the mean and standard deviation for the dwell time at a Cash-Only ATM are 52 and 23 seconds, respectively.

Also, the User will need to specify the number of transactions per visit for each service point. The default values for these parameters are one.

There are only three parameters in this category for each model. They are "Number of replications", "Stream number identifier", and "Check input option identifier". In most applications, the User will not need to change the values of these parameters. If the User wishes more precision in the model's estimates of the mean performance measures, the User should increase the value of "Number of replications". We recommend that the User does not reduce the value of this parameter below 30 when using the model results to make inferences about the checkstand or front-end design. Changing the value of the "Stream number identifier" will run the scenario using a different sequence of random numbers. Finally, the "Check input option identifier" specifies whether the parameter values for a scenario file are written to a file: *c:\Arena Viewer\BEM\BEMChk.out*. The purpose of this file is to verify input parameter values or for technical support.

To modify the parameter values for a scenario, the User should select the Edit Scenario button 560 on the Input Module.

Figure 8 depicts an Edit Parameter File form 800. The Edit Parameter File form 800 allows the User to view or change the values for each parameter in the

scenario files created by the User. Recall the User can not change the values in a model's Default scenario.

Each time the User enters this form, an edit table 810 displays the full set of parameters in the DID. The edit table 810 includes a parameter column 850, a value column 855, a range column 860 and a description column 865. The User can use the scroll bar 815 to the right of the edit table 810 to browse through the full set. Alternatively, the User can view only a subset of the parameters corresponding to a particular category by clicking on a category button in a Parameter Categories section 820. The parameter categories are represented by buttons including configuration 822, customer demand and routing 824, transaction characteristics 826, labor schedule 828 and model parameters 830.

There are two approaches for editing a parameter's value(s) depending on whether the parameter ha a single value (called a scalar parameter) or has multiple values (called a non-scalar parameter or an ARRAY). To edit the value for a scalar parameter, the User selects the cell in the Value column 855 of the edit table 810 for the parameter that the user wants to change and enters the new value. For example, to change the scenario Start Time parameter from 9 a.m. to 8:30 a.m., in Figure 9, the User selects the cell containing the value of 9 and type in 8.5. Note the Start Time and End Time parameters are in units of hours from 12 midnight. When changing values, the User should make sure the new value is within the allowable range displayed in the Range column 860 for the parameter. If the User enters a value outside the allowable range, the BEM module will remind the User with a warning message.

To edit the values for a non-scalar parameter, the User must click on the small rectangle icon just to the left of the Parameter field. This action will evoke a new form that will allow the User to edit each value for the parameter. A non-scalar parameter will have the word "Array" in the parameter column and no value in the Value column.

There are ten non-scalar parameters in the BEM module. The following is a list of these ten non-scalar parameters:

1. Number of arrivals per hour in 15-minute intervals
2. Customer Decision Matrix
3. Self-service balk probabilities
4. Operator assisted balk probabilities
5. Schedule of Tellers
6. Schedule of Platform personnel
7. Schedule of Meeter-Greeters
8. Counter transaction type probabilities
9. Counter transaction times parameter 1
10. Counter transaction times parameter 2

After the User clicks on the rectangle icon 842, 844, 846, 848 adjacent to the left side of the Parameter column 850, the BEM module will open a new form that allows the User to modify the parameter's values. The edit forms are described below for these non-scalar parameters.

The Arrival Rate Schedule form allows the User to change the values for the parameter that describes the rate at which customers arrive to the branch. The model uses these rates to randomly generate customer arrival times throughout the simulation scenario. Figure 9 depicts the form for editing the "expected number of arrivals per hour in 15-minute intervals".

An edit table in the Arrival Rate Schedule form 1000 lists values from 12:01a.m. to 12:00 p.m. in 15-minute intervals in a time interval column 1040. To change a value, the User scrolls to the time interval using a scroll bar 1015 that the User wants to edit, selects the corresponding cell in a Number of Arrivals column1050 and enters the new value. The units for the values entered into this

parameter are number of arrivals per hour in 15 minutes not the number of arrivals in 15 minutes.

The User must understand this important difference to prevent running a scenario with a different customer arrival pattern then the User intended to run. For example, if the User wants to represent 100 customers per hour from 9:00 to 9:30 a.m., and 150 customers per hour from 9:30 to 10:00 a.m. then the entries should be:

9:01-9:15 a.m. 100

9;16-9:30 a.m. 100

9:31-9:45 a.m. 150

9;46-10:00 a.m. 150

The model ignores values entered in the Number of Arrivals column 1050 before and after the time intervals specified by the Start Time and End Time parameters, respectively.

There are two options from this form, either a Print Schedule button 1060 or Return to Edit form 1065. The Print Schedule button 1060 creates a report containing the arrival rate schedule and displays it on the screen. The User can then send the report to a printer or save it to a file in a variety of data formats.

Figure 10 depicts a Customer Decision Matrix Parameter form 1000 used to edit the Customer Decision Matrix Parameter. This Customer Decision Matrix parameter defines the probability a customer visits a particular sequence of service points when the customer enters the bank. The logic represented by this approach is referred to as probabilistic routing. For example, Figure 10 illustrates that 2% of the entering customers will use a Business Deposit machine as the first service point the customer visits. After finishing at the Business Deposit machine, 14% go onto a Multifunction ATM (i.e., ATMMulti) machine and 86% exit the bank (the horizontal scroll must be used to se the 0.86 in the Exit column).

Two important things to remember when modifying the CDM:

1) The row probabilities must sum to 1

2) The only valid entries for a cell are between 0.0 to 1.0

The Customer Decision Matrix 1000 includes "from" rows and "to" columns. The "from" rows are entrance 1012, ATM cash 1014, ATMMulti 1016, ATMGen 1018, DepPer 1020, DepBus 1022, DepPost 1024, Change 1026 and KioskBank 1028. The "to" columns include entrance 1070, ATMCash 1072, ATMMulti 1074, ATMGen 1076, DepPer 1078, DepBus 1080, DepPost 1082, Change 1084, KioskBank 1086 and KioskOther 1088.

The BEM module checks to make sure the rows sum to one and will issue a warning message if they do not. If this occurs, then the User will have to find the row that violates this requirement and make the necessary corrections. The BEM module does not check if the data entered is within the range of 0.0 to 1.0, so it incumbent on the User to adhere to this requirement.

There are two options from this form, either a Print Matrix button 1060 or a Return to Previous Form button 1065. The Print Matrix button 1060 creates a report containing the CDM and displays it on the screen. The User can then send the report to a printer or save it to a file in a variety of data formats. The Return to Previous Form 1065 returns the User back to the Edit Parameter File form 800.

Figure 11 depicts a form to edit the Self-Service and Operator Assisted Balk Probabilities parameters. These parameters specify the probability that a new customer balks (leaves without receiving service) from a self-service or operator assisted resource when its queue size reaches or exceeds the value entered in the balk queue size threshold parameters. Operator assisted resources tab 1120 are the Counter Positions, Reception Desk, and Meeting Rooms. Once the User has entered this form, the User can select the tab of the other parameter and edit its values before returning to the Edit Parameter File form 800.

The balk probabilities indicate the probability that a newly arriving customer will not join the queue when its size reaches the threshold queue size or

greater. For example, assume there are 5 people waiting in line to use a single Kiosk-Bank machine and the self-service threshold queue size parameter is set to 4 and the balk probabilities are those displayed in Figure 11. Then, say the next event is the arrival of a new customer who wishes to use the Kiosk-Bank. In this case, the new customer would balk with probability 0.5. For this example, a customer would never balk if the queue size is less than 4 and the queue size would never exceed 7 (because the Threshold Queue Size+3 is 1.0). If the queue size would get larger than the Threshold Queue Size+3, then the model would use the probability in this last cell for the probability that a customer balks.

There are two options from this form, either a Print Schedules button 1160 or Return to Previous Form button 1165. The Print Schedules button 1160 creates a report containing the balk probabilities for both resource types and displays it on the screen. The User can then send the report to a printer or save it to a file in a variety of data formats. The Return to Previous Form button 1165 returns the User back to the Edit Parameter File form 800.

Figure 12 depicts a Personnel Schedules edit form 1200. The Labor Schedule category contains three parameters:

1) Schedule of Tellers
2) Schedule of Platform personnel
3) Schedule of Meeter-Greeters

These three parameters allow the User to enter the number of staff for the three types of labor in 30-minute intervals during a scenario.

The Personnel Schedules edit form includes parameter tabs for Platform Personnel 1210, Tellers 1220, Meeter Greeters 1230 and All Personnel 1240. Figure 12 illustrates the current active parameter is the "Schedule of Tellers". As depicted in Figure 12, an edit table 1210 includes a Time Interval column 1250 in half hour increments and a Tellers column 1260. After the User enters this form

from the Edit Parameter File form 800 for any of the three parameters, the User can edit the values for the other parameters by selecting the corresponding parameter tab. The tab labeled All Personnel 1240 displays an edit table for all three parameters at the same time.

The BEM module requires that an operator-assisted resource have at least one staff member in order to provide service to a customer. If one is not available and the resource is in a customer's route, then the customer will skip the resource and move on to the next step in their routing sequence. The only other requirement is the User should enter only nonnegative integer values. The model ignores values entered in the schedules before and after the time intervals indicated by the Start Time and End Time parameters, respectively. Also, the User should not enter a value in a schedule larger than the number of service point locations. For example, if the number of Reception Desks is one, then any entering a value greater than one in the "Schedule of Meeter-Greeters" will result in the same performance as entering a value of one. The only difference is that the User has more scheduled Meeter-Greeter time.

After the User finishes editing the values in this form, the User can select one of two options, either a Print Schedule button 1260 or a Return to Edit form button 1265. The Print Schedule button 1260 creates a report containing the schedules for all three parameters by time of day and displays it on the screen. The User can than send the report to a printer or save it to a file in a variety of data formats.

Counter transaction type probabilities parameters are displayed in Figure 13 as form 1300. The BEM module allows the User to specify up to five different types of transactions that a customer can receive at a Counter Position. The reason for this flexibility is to allow the User to represent counter transaction in greater detail. This feature would be useful if transaction type counts are

important or if there is significant differences between transaction times by type. For example, five transaction types might be the following:

1) House items cashed
2) Remittance check cashed
3) Deposit (credit) with cash
4) Deposit without cash
5) Other, e.g., currency exchange, traveler's checks, etc.

If this added detail is unnecessary, then the User may represent just one counter transaction type by entering the values into the counter transaction type probabilities.

Figure 14 depicts a form 1400 to edit the "Counter transaction times parameter 1" is shown in Figure 14. A "Counter transaction times parameter 2" parameter is similar to this form and is not discussed herein.

Similar to the other non-scalar parameter edit forms, the User can select one of two options after the User finishes editing the values in this form, either a Print Values button 1460 or a Return to Previous form button 1465. The Print Values 1460 button creates a report containing the values for all three counter transaction parameters and displays it on the screen. The User can than send the report to a printer or save it to a file in a variety of data formats.

The User can delete scenario files created by the User by selecting the scenario on the Input Module form and evoking the Delete Scenario option. Performing this action will open the Delete Parameter File form 1500 displayed in Figure 15.

There are two options from this form: a Delete and Return button 1500 and a Return Without Deleting button 1565. If the User selects the Delete and Return button 1560, then the BEM module opens a window which prompts the User to confirm the request to delete the scenario file. Selecting OK to the

confirmation will delete the scenario file and return the User to the Input Module Form 500. Selecting CANCEL on the confirmation will return the User to the Delete Parameter File form 800 without deleting the file. The Return Without Deleting option 1565 returns the User to the Input Module form 500 without deleting the scenario file.

The User can display a model's DID by selecting the Print Scenario option from the Input Module form 500. Figure 16 depicts the first page of the DID for the SSB model. The User can use the control buttons at the top of this window to:

1. Page through the report
2. Print the report to the default Windows 95™ printer, or
3. Save the report to a disk file in the name of User's choice and in a variety of data formats.

After the User finishes with the DID report, the User can close the report window as one would with any other Windows 95™ window, e.g., click on the "X" icon in the upper right hand corner.

The Print Scenario option 575 from the Input Module 500 will create and display a report of only a model's scalar parameters and their values. To generate a report containing the values for non-scalar parameters, the User needs to select the print option button on the non-scalar parameter edit form. For example, selecting the Print Schedule 1260 from the Personnel Schedule edit form 1200 will print the values for the three labor schedule parameters.

The User can run a simulation model from the Input Module form 500 or the Run Simulation Module form 1700 discussed below. There is no difference between running a model from either location in the BEM module. In each case, the User selects the model and scenario the User wishes to run and then the User starts the simulation by selecting the Run Simulation button 580. Checking the Animation box 585, the Run Simulation button 580 will turn on the animation.

The User can run existing scenario files from the Run Simulation Module form 1700 depicted in Figure 17. A models table 1710 includes the following

models: a Self Service Branch Model 1 1712, a Counter Service Branch Model 1 1714 and a Retail Service Branch model 1 1716 activated by rectangular boxes 1722, 1724 and 1726, respectively. A scenarios table 1730 includes a Default Scenario 1732 and a Case 1 Scenario activated by rectangular boxes 1742 and 1744, respectively.

There are three options from this form: a Return to Main Menu button 1770, a Print Scenario button 1775 and a Run Simulation button 1780. The first button 1770 will generate a report containing a model's DID and display it on the screen. Figure 17 illustrates the DID report for the FEM1 model. The User can then send the report to a printer, save the report to a disk file, or close the report and return to the Run Module form. The Run Simulation options will start running the model and scenario selected in the Models and Scenarios tables of this form.

To run a model with the animation on, the User checks the animation box 1785 before selecting the Run Simulation button 1780. This action launches the Arena Viewer™ application, loads the model, and starts to run the scenario. Figure 18 illustrates the animation overview screen of the SSB model.

In animation mode, the model scenario will start running, i.e., Go, automatically. To pause the model, the User needs to click on the Pause button, i.e., the button with two vertical lines, "||". The User may want to pause a model, for example, to describe the scenario to their audience or check to make sure the scenario status variables displayed on the screen appear correct. When the User is ready to start the model again, they select the Go button, i.e., the right arrow button, "υ". To end the model, the user needs to click on the Pause button, "||", and then the End button, i.e., the button with a rectangle. The User can restart the model after a Pause or begin it again after they select the Pause and End button, by selecting the Go button. When the User finishes demonstrating the model or is confident the model scenario appears correct, they need to End the simulation scenario, close the Arena Viewer™ application, and return to the BEM

application. The simplest method to close the Arena Viewer™ application is to click on the **X** icon in the upper right hand corner of the screen.

One important reason to first run a model scenario in animation mode is the simulation models perform additional checks on whether the parameter values for a scenario are feasible or not. If an error is found, the model will stop prematurely (i.e., before the model completes the specified number of replications). If the model stops, Arena Viewer™ will display a window asking if the User would like to see the model's results. Answer **Yes** to this prompt and a window displaying a text file will display on the screen. The first line of this text file will contain an error message that indicates why the model stopped. The User should take note of the error message, close the text file window, close the Arena Viewer™, and go into the Input Module and make the correction to the input scenario indicated by the error message. If the User is in animation mode and the model scenario runs to completion, then the User should click the **No** button on the prompt to see the model's results, close the Arena Viewer™ application, and go into the Output Module to see the results.

The present invention has also set up several screen views in each of the simulation models to help the User better understand and communicate the model's results. One can display these screen views only when a model is run in animation mode. Arena Viewer™ lists the screen views for each model when the User presses the "m" key (lower case) on the keyboard. Figure 18 shows the screen views available in the SSB Model.

The User can switch between screen views by entering the lower case letter corresponding to the screen view title. For example, pressing the "a" key switches the view back to the animation overview screen displayed in Figure 18. Pressing the "s" key displays a close-up view of the branch shown in Figure 18. Figure 20 displays a screen view that gives a summary description of the model. Figure 21 depicts the screen view displayed when pressing "o". This screen shows the current value of some of the output performance measures reported by

the model. Figure 22 shows a view that contains the values of several key scenario parameters by pressing "I". Lastly, Figure 23 shows a graph of the number of customer in the branch as a function of time of day.

When the User is ready to run simulation experiments to analyze the impact of certain design, procedure, or technology changes on branch performance, the User should do so with the animation off. This is referred as an analysis mode of running scenarios. When the animation is off, the models execute much faster allowing the User to conduct more statistically sound experiments. The User can also evaluate many more scenarios in a shorter time period.

To run a scenario in analysis mode, the User selects the Run Simulation button 1780 on the Run Simulation module form 1700 with the Animation box 1785 left unchecked. After a slight delay to initialize the model, a window will appear displaying the current number of replications completed out of the total number of replication you specified in the input parameter "Number of simulation replications". For example, Figure 26 illustrates the model has processed 2 out of 30 replications of this scenario.

When the model completes all the replications, the BEM module will display a window to ask if you would like to see the results. Figure 27 displays an example of this window. Selecting **Yes** will cause the BEM module to go to the Output Module form 500. Selecting **No** will return the BEM module to the Run Simulation Module form 1700.

Output Mode

The BEM module will generate one standard set of output performance measures each time the User runs a simulation model. There are up to 107 performance measures in this set. These measures include throughput, balk counts, dwell times, queue sizes and times, and resource utilization. Appendix B

provides the performance measures reports for the Default Scenarios for each of the models.

Figure 28 shows the Output Module forms. To view the report, simply use a scroll bar 2815 to the right of a Performance Measure table 2810. To view performance measures for a particular model resource, click the resource button a Resource Type section. In Figure 28, the set of buttons 2820 includes an All Measures button 2822, a Branch button 2824, an ATM button 2826, a Deposit button 2828, a Counter button 2830, a Labor button 2832, a Change button 2834, a Kiosk button 2836, a Meeting Room button 2838, a Phone button 2840, a Reception button 2892 and a Writing Desk button 2844.

The Output Module forms also display the Model Name in box 2860, Scenario Name in box 2862, and the number of replications (e.g., 30 in Figure 28 in box 2850) that were used to generate the report. The number of replications indicates the number of times the scenario was repeated. The purpose for replicating a scenario is to obtain sufficient number of independent and identically distributed observations so one can estimate the performance measures, e.g., average number of customer in the bank, with enough precision to make valid inferences. In general, increasing the number of replications increases the precision (reduces the standard error) in estimating the average performance measure.

The performance measures report contains estimates for the average, standard error, minimum, and maximum value for each performance measure. The minimum and maximum values are the minimum and maximum values of the summarized performance measure at the end of a replication and not necessarily the minimum and maximum value during a replication. The standard error statistic provides a measure of error for how well the average value reported by the model estimates "the true" average value. In general, one can view "the true" average value to fall within plus or minus two times the standard error value around the estimated average.

An alternative way to view a performance measures report is to select the Print Results button. This action creates a performance measures report document and displays it on the screen. Figure 29 illustrates the report for the SSB model. The User can use the control buttons at the top of this form to page through the report, print it, or save it to a disk file in various data formats.

The other two options for the output Module form are Return to Input Module and Return to Main Menu.

The BEM module does not save simulation results from previous simulation runs. So, the User will need to send the report to a printer or write it to a file to retain the results each time they run a scenario. Writing the report to a file and reading it into a spreadsheet application such as Excel™ or Lotus™ makes it easier to consolidate output reports comparing system performance across simulation scenario.

It shall now be apparent that a BEM module has been described. Advantageously, the BEM module is a self-contained PC desktop application that allows a bank consultant to quantitatively analyze changes to their branch environments. The BEM module uses simulation to mimic the complex interactions between customers and bank resources in three branch environments: Customer Service, Self Service, and Retail Service. The goal of the present invention is to provide a bank consultant with a tool that can predict the impact of new branch layouts and design changes before a bank commits to their implementation. The BEM module will provide bank managers with:

1) New information about their business which will help them address key business issues, and

2) A strategic planning tool to reduce the time, risk, and uncertainties of investing in new technologies or design changes.

Another MDM application is called a Lane and Front End Effectiveness Model (LFEM). The LFEM is a self-contained PC desktop application that

allows an analyst to quantitatively predict the impact of changes to their checkout operations. This application, according to the present invention, includes four simulation models representing the complex interactions between customers, staff and checkstand resources. Three of these models are detailed lane models and the fourth is a store front-end checkout model. An analyst can use the LFEM to evaluate, in detail, different checkstand configurations and transaction processes and the effect these changes have on overall front-end performance. The purpose of this application is to provide retailers with timely information to reduce the risk and uncertainties of investing in new technologies or design changes by predicting their impact and return before committing resources to their acquisition or implementation. The LFEM application is included herein as attachments as follows: Attachment E entitled "LaneModel" (pp. 1-151); Attachment F entitled "Front End Model (pp. 1-101); and Attachment G entitled "LFEMapp" (pp. 1-95).

It will be readily seen by one of ordinary skill in the art that the present invention fulfills all of the objects set forth above. After reading the foregoing specification, one of ordinary skill will be able to affect various changes, substitutions of equivalents and various other aspects of the invention as broadly disclosed herein. It is therefore intended that the protection granted hereon be limited only by the definition contained in the appended claims and equivalents thereof.

What is claimed is:

1. A method of providing output to predict the impact of changes to retail and financial customer services points using management decision models, comprising:

listing categories of parameters with each parameter representing an aspect of a business operation being modeled;

choosing at least some of the parameters to describe a particular business scenario;

assigning values to the chosen parameters;

invoking at least one module in a management decision module to provide output to a user.

2. The method of claim 1, wherein the parameters include:

a demand category;

a configuration category;

a transaction characteristic's category;

a system logic parameter's category;

a model category; and

a financial category.

3. The method of claim 1, wherein the output includes one of quantative information and visual information.

4. The method of claim 3, wherein the quantative information is in the form of a report and the visual information is an animation.

5. The method of claim 4, including one or more of the following modules: a database management module, a simulation engine, an animation module, an environmental design layout module, financial module and a quick assessment module.

6. The method of claim 2, wherein the output includes one of quantative information and visual information.

7. The method of claim 6, wherein the quantative information is in the form of a report and the visual information is an animation.

8. The method of claim 2, comprising changing the assigned values.

9. A method of providing output to predict the impact of changes to a bank branch using a branch effectiveness model, comprising:

listing categories of parameters with each parameter representing an aspect of a bank branch being modeled;

choosing at least some of the parameters to describe a particular business scenario;

assigning values to the chosen parameters;

invoking at least one module in the branch effectiveness model to provide output to a user.

10. A method of providing output to predict the impact of changes to a bank branch using a branch effectiveness model, comprising:

selecting an application from the branch effectiveness model;

selecting a model type from the branch effectiveness model;

choosing a subset of parameters from the model type;

assigning values to the chosen parameters; and

invoking at least module in the branch effectiveness module to provide output to a user.

11. A method of providing output to predict the impact of changes to retail and financial customer service points using management decision models, comprising:

listing categories of parameters with selecting an application from management decision models;

selecting a model type from the selected application;

choosing a subset of parameters from the selected model type;

assigning values to the chosen parameters; and

invoking at least one module in the selected application to provide output to a user.

12. The method of claim 11, comprising selecting a model from the selected model type.

13. The method of claim 11, wherein the management decision model includes a database management module, a simulation engine, an animation module, an environmental design layout model, a financial module and a quick assessment module.

14. The method of claim 11, wherein the output includes one of quantative information and visual information.

15. The method of claim 14, wherein the quantative information is in the form of a report and the visual information is an animation.

16. The method of claim 11, comprising changing the assigned values.

17. The method of claim 11, wherein the parameters include:

a demand category;

a configuration category;

a transaction characteristic's category;

a system logic parameter's category;

a model category; and

a financial category.

8-31-99 as filed

FIG. 1

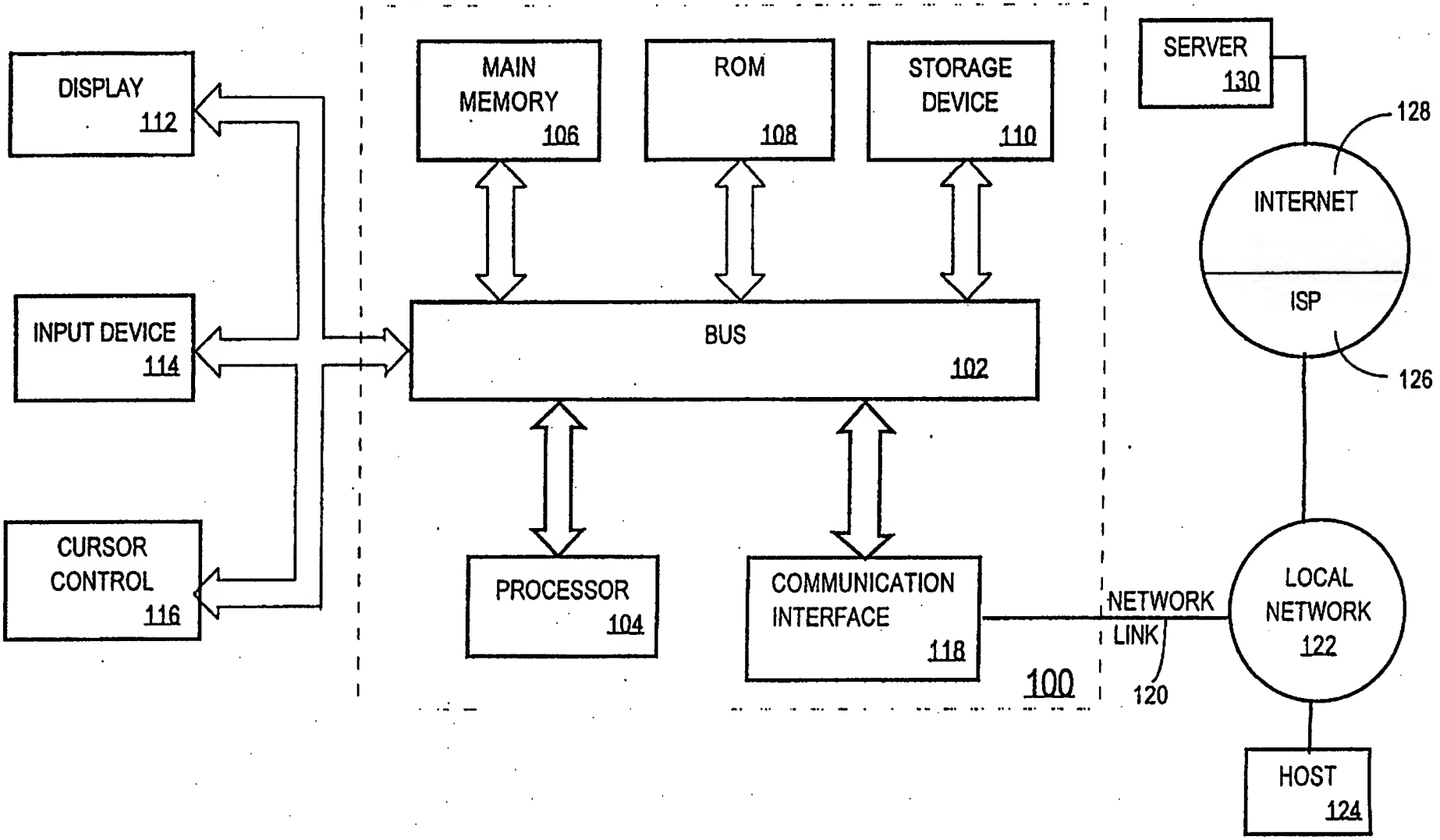
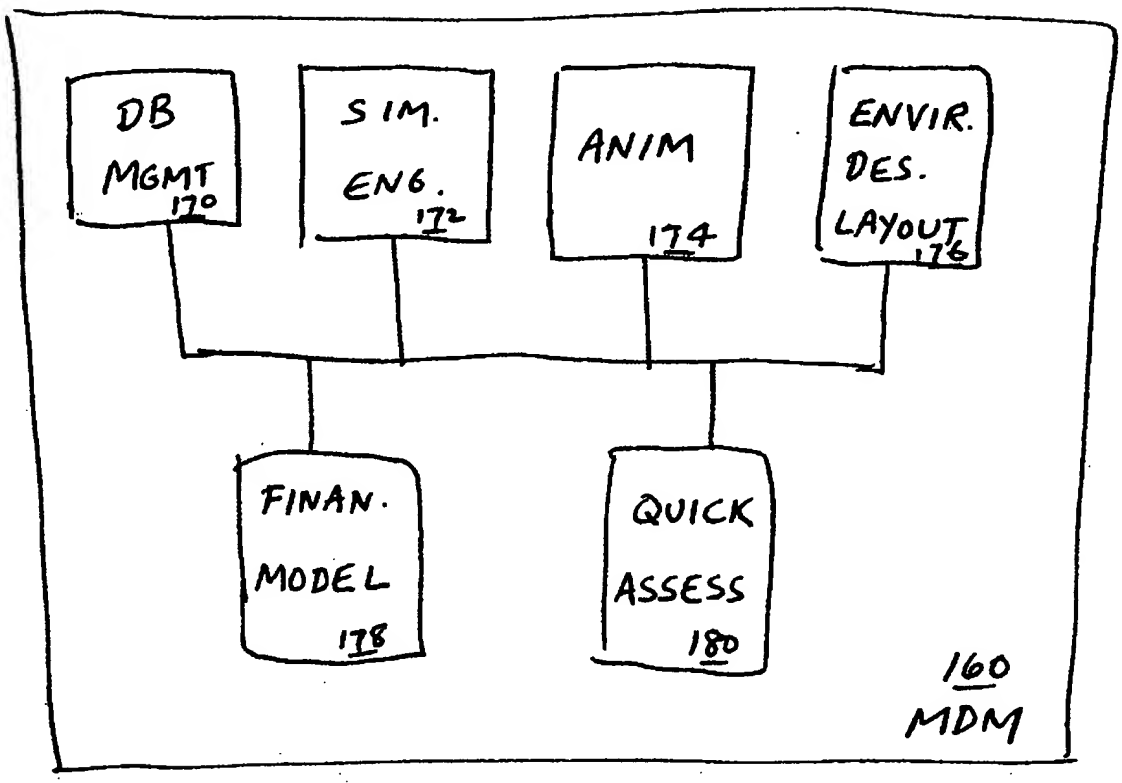


FIG. 1A


DB MGMT 170
SIM. ENG. 172
ANIM 174
ENVIR. DES. LAYOUT 176
FINAN. MODEL 178
QUICK ASSESS 180
160 MDM

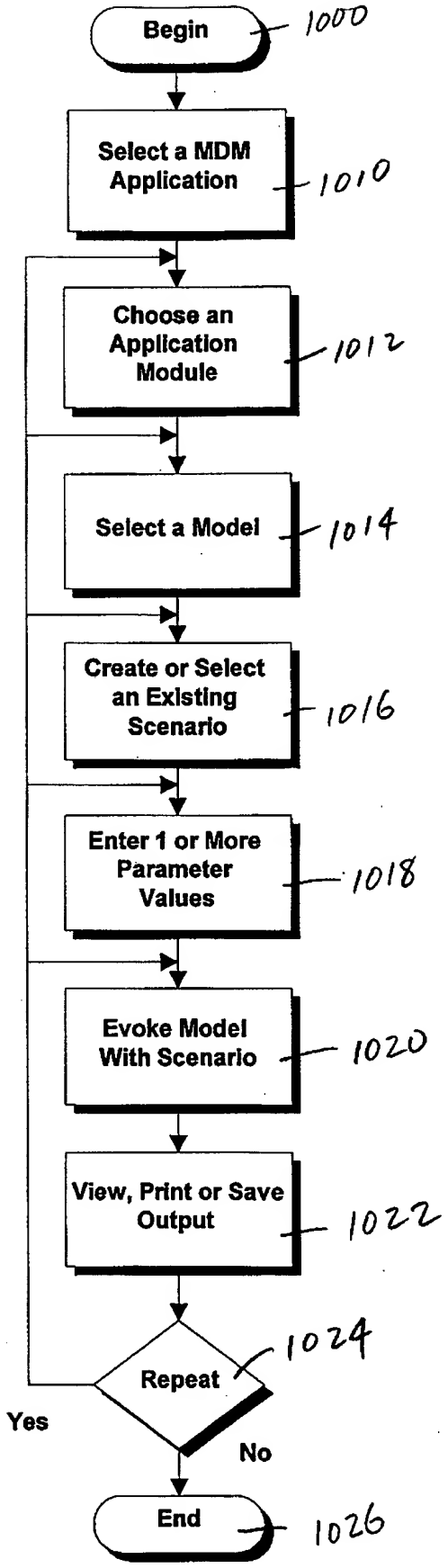
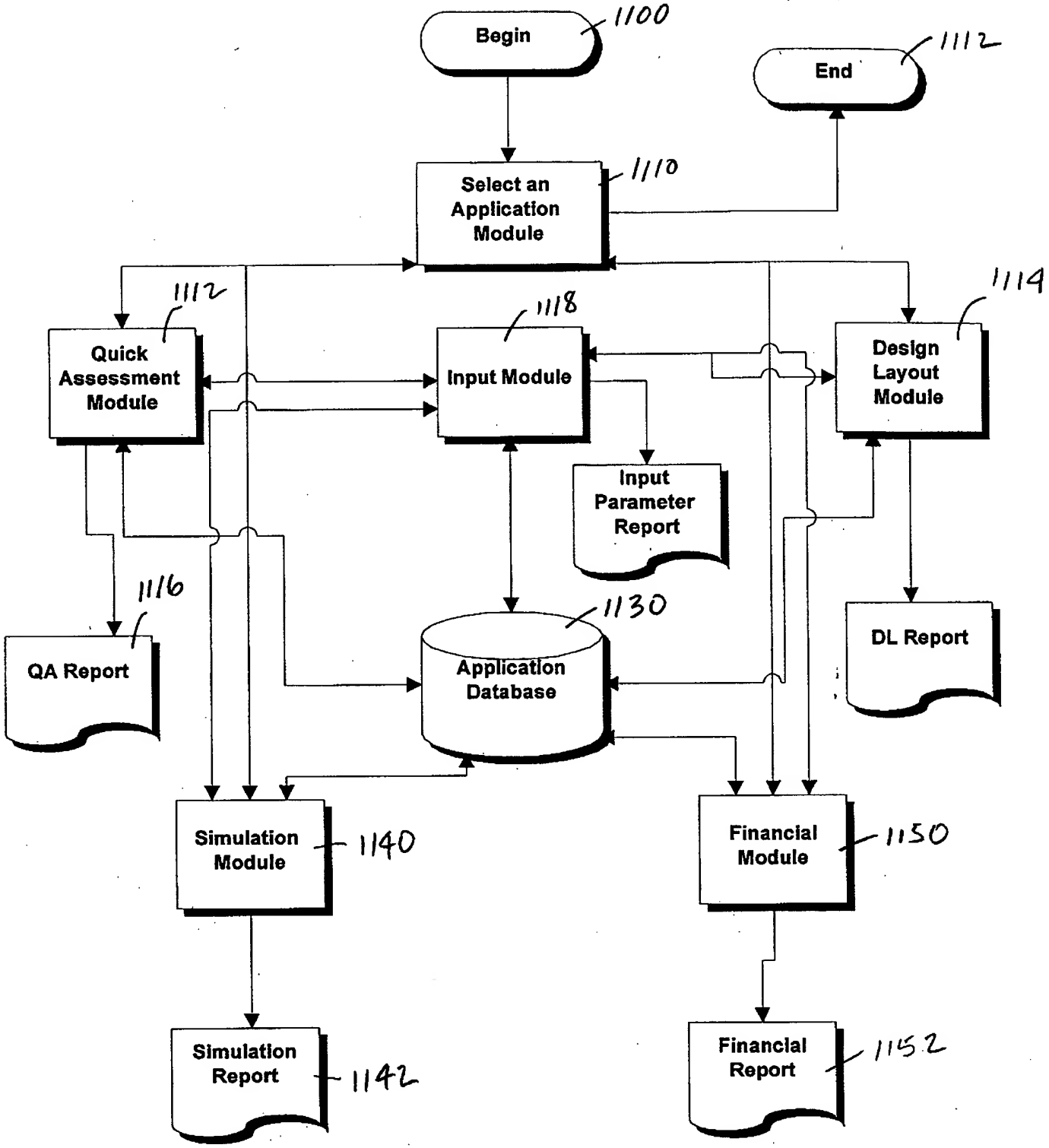

Begin
1000
Select a MDM Application
1010
Choose an Application Module
1012
Select a Model
1014
Create or Select an Existing Scenario
1016
Enter 1 or More Parameter Values
1018
Evoke Model With Scenario
1020
View, Print or Save Output
1022
Repeat
1024
Yes
No
End
1026

FIG. 1B

FIG. 1C


Begin
1100
End
1112
Select an Application Module
1110
Quick Assessment Module
1112
Input Module
1118
Design Layout Module
1114
Input Parameter Report
QA Report
1116
Application Database
1130
DL Report
Simulation Module
1140
Financial Module
1150
Simulation Report
1142
Financial Report
1152

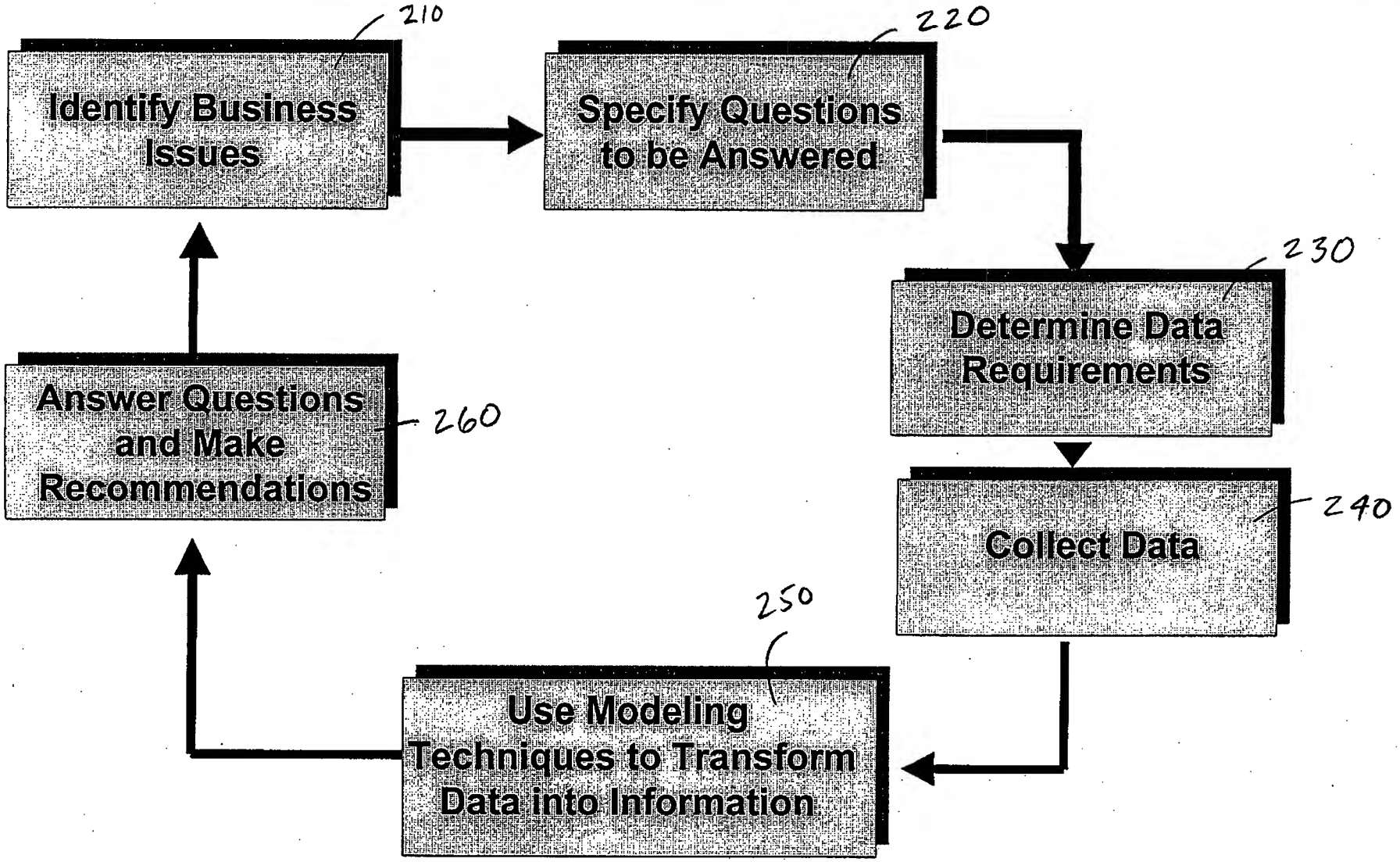

210
Identify Business Issues
220
Specify Questions to be Answered
230
Determine Data Requirements
240
Collect Data
250
Use Modeling Techniques to Transform Data into Information
260
Answer Questions and Make Recommendations

FIG. 2

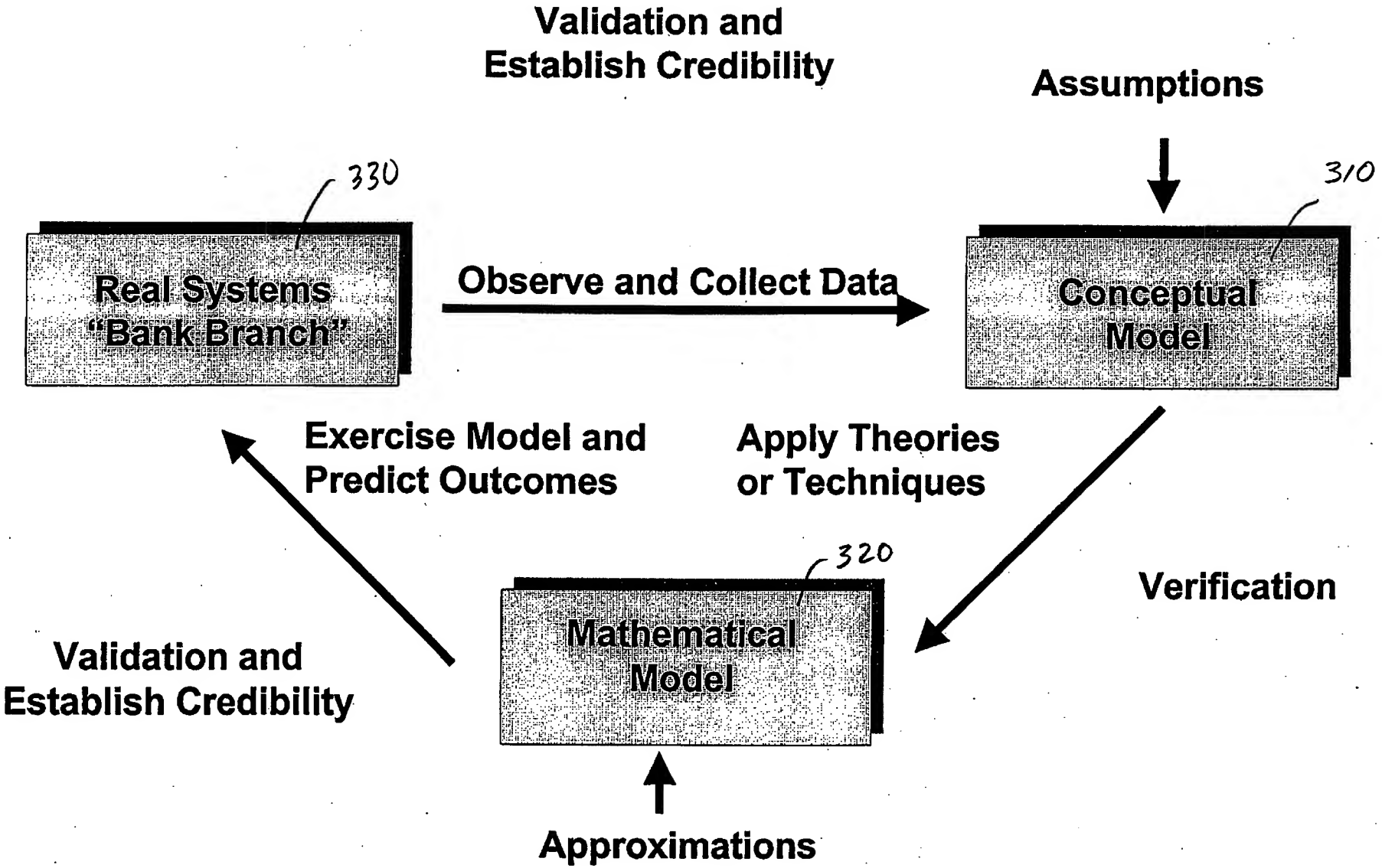

Validation and
Establish Credibility
Assumptions
330
310
Real Systems
"Bank Branch"
Observe and Collect Data
Conceptual
Model
Exercise Model and
Predict Outcomes
Apply Theories
or Techniques
320
Verification
Validation and
Establish Credibility
Mathematical
Model
Approximations

FIG 3

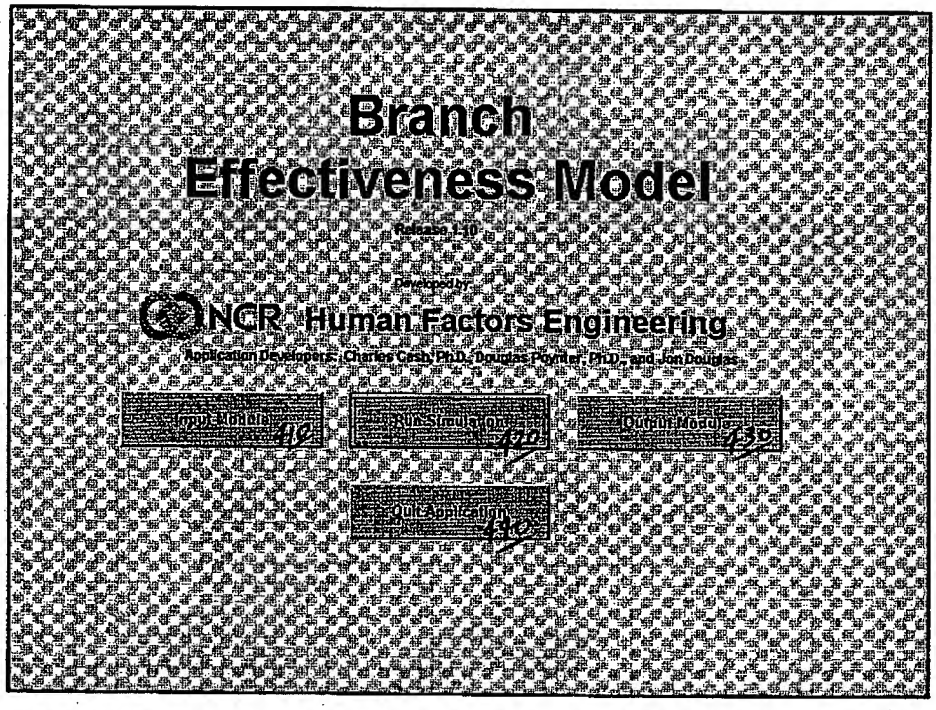

400
Branch
Effectiveness Model
NCR Human Factors Engineering
Input Module
410
Run Simulation
420
Output Module
430
Quit Application
440

FIG. 4

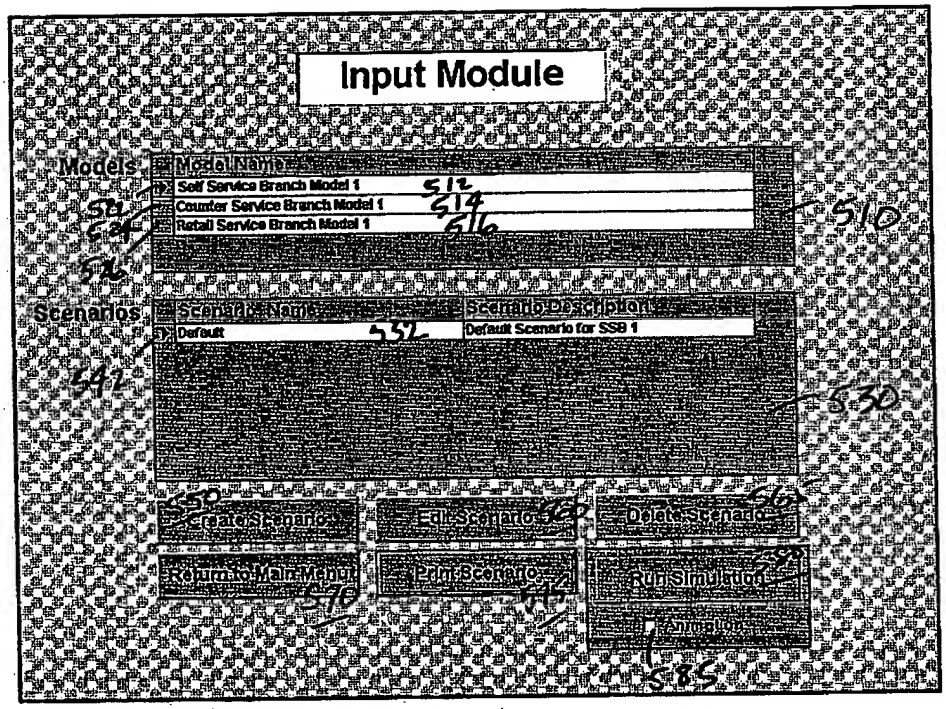

Input Module
Models
Model Name
Self Service Branch Model 1
Counter Service Branch Model 1
Retail Service Branch Model 1
Scenarios
Scenario Name
Scenario Description
Default
Default Scenario for SSB 1
Create Scenario
Edit Scenario
Delete Scenario
Return to Main Menu
Print Scenario
Run Simulation
Animation
500
510
512
514
516
520
522
524
530
532
540
542
550
560
562
570
572
580
582
585

FIG. 5

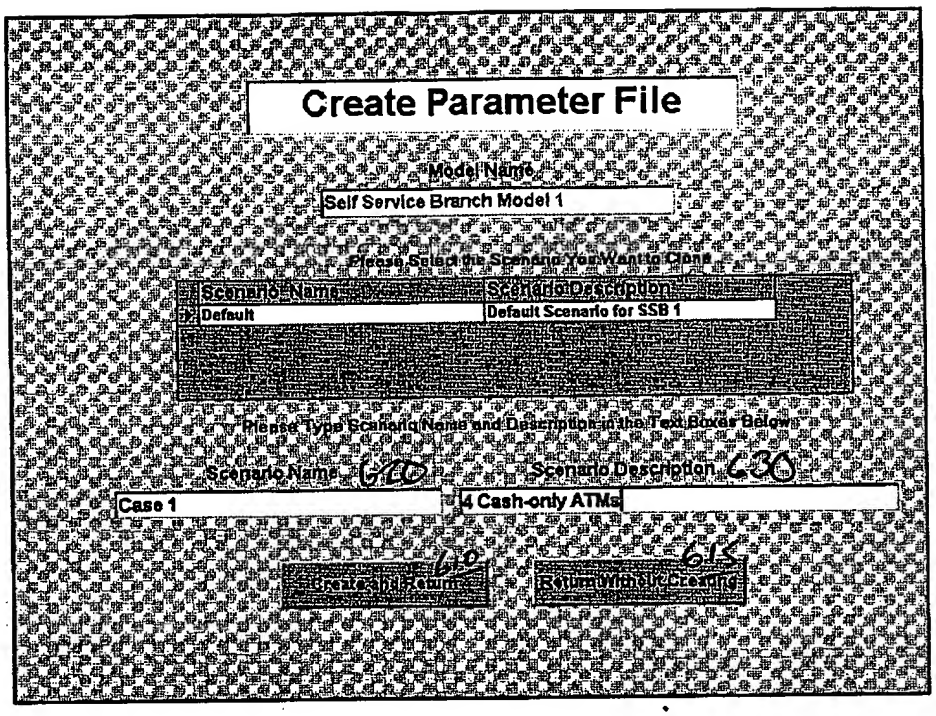

Create Parameter File
Model Name
Self Service Branch Model 1
Please Select the Scenario You Want to Clone
Scenario Name
Scenario Description
Default
Default Scenario for SSB 1
Please Type Scenario Name and Description in the Text Boxes Below
Scenario Name
Scenario Description
Case 1
4 Cash-only ATMs
Create & Return
Return Without Creating
600
610
620
630
615

FIG. 6

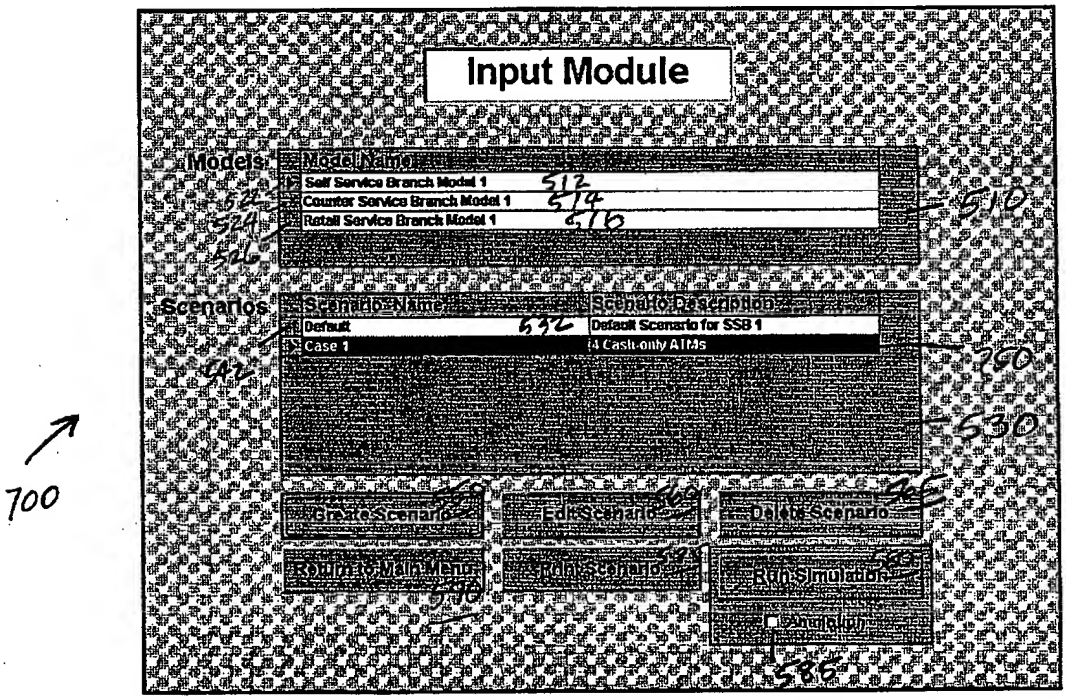

Input Module
Models
Model Name
Self Service Branch Model 1
Counter Service Branch Model 1
Retail Service Branch Model 1
Scenarios
Scenario Name
Scenario Description
Default
Default Scenario for SSB 1
Case 1
4 Cash-only ATMs
Create Scenario
Edit Scenario
Delete Scenario
Return to Main Menu
Print Scenario
Run Simulation
Annualize
700
510
512
514
516
520
522
524
526
530
532
540
550
560
570
580
582
584
586

FIG. 7

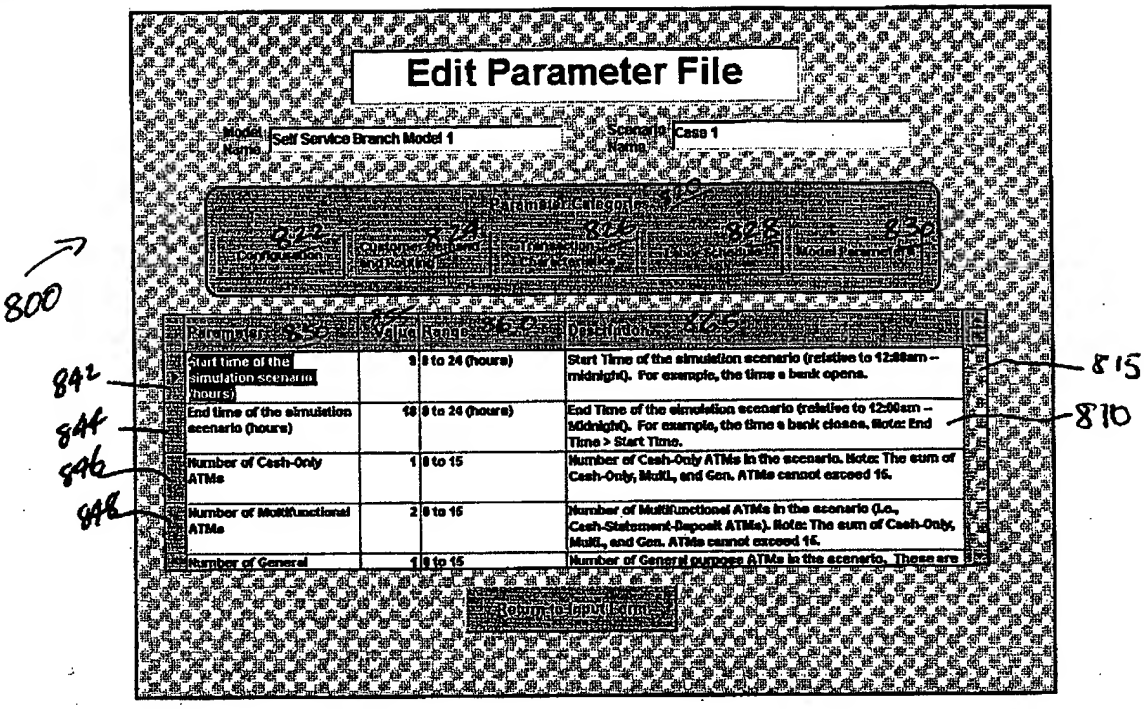

Edit Parameter File
Model Name: Self Service Branch Model 1
Scenario Name: Case 1
Parameter Categories
Customer Arrivals
Transaction Times
Model Parameters
Parameter
Value
Range
Description
Start time of the simulation scenario (hours)
9
8 to 24 (hours)
Start Time of the simulation scenario (relative to 12:00am -- midnight). For example, the time a bank opens.
End time of the simulation scenario (hours)
18
8 to 24 (hours)
End Time of the simulation scenario (relative to 12:00am -- Midnight). For example, the time a bank closes. Note: End Time > Start Time.
Number of Cash-Only ATMs
1
0 to 15
Number of Cash-Only ATMs in the scenario. Note: The sum of Cash-Only, Multi., and Gen. ATMs cannot exceed 15.
Number of Multifunctional ATMs
2
0 to 15
Number of Multifunctional ATMs in the scenario (i.e., Cash-Statement-Deposit ATMs). Note: The sum of Cash-Only, Multi., and Gen. ATMs cannot exceed 15.
Number of General
1
0 to 15
Number of General purpose ATMs in the scenario. These are
Return to Input Form
800
842
844
846
848
815
810

FIG. 8

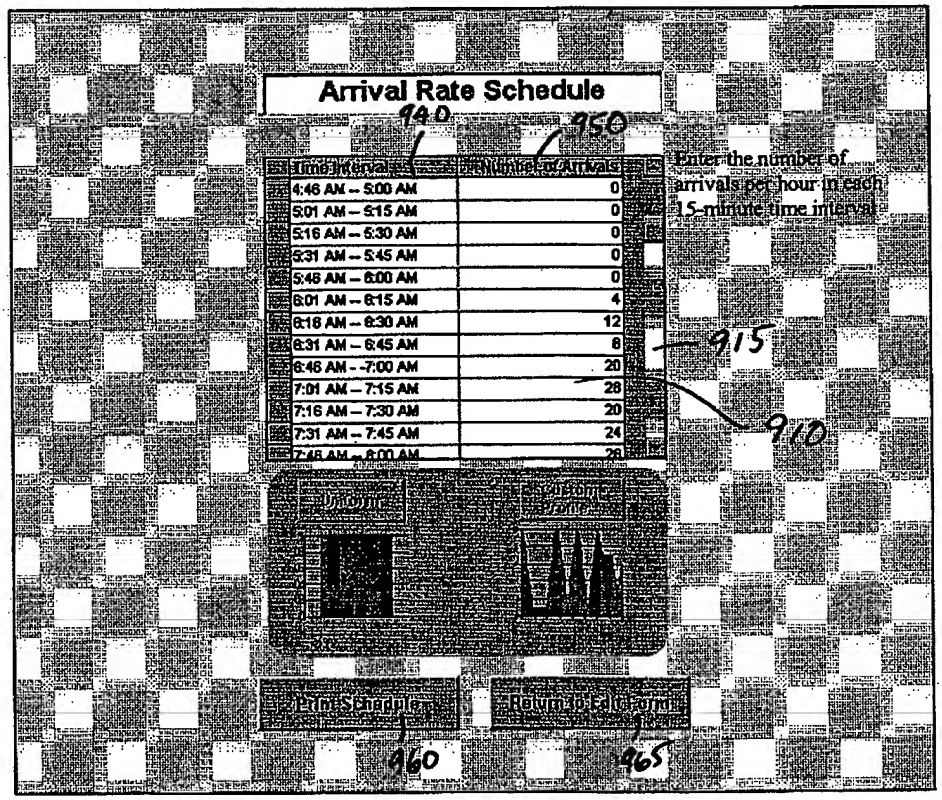

Arrival Rate Schedule
940
950
Time Interval
Number of Arrivals
4:46 AM -- 5:00 AM 0
5:01 AM -- 5:15 AM 0
5:16 AM -- 5:30 AM 0
5:31 AM -- 5:45 AM 0
5:46 AM -- 6:00 AM 0
6:01 AM -- 6:15 AM 4
6:16 AM -- 6:30 AM 12
6:31 AM -- 6:45 AM 8
6:46 AM -- 7:00 AM 20
7:01 AM -- 7:15 AM 28
7:16 AM -- 7:30 AM 20
7:31 AM -- 7:45 AM 24
Enter the number of arrivals per hour in each 15-minute time interval.
915
910
Print Schedule
Return to Edit Form
960
965

FIG. 9

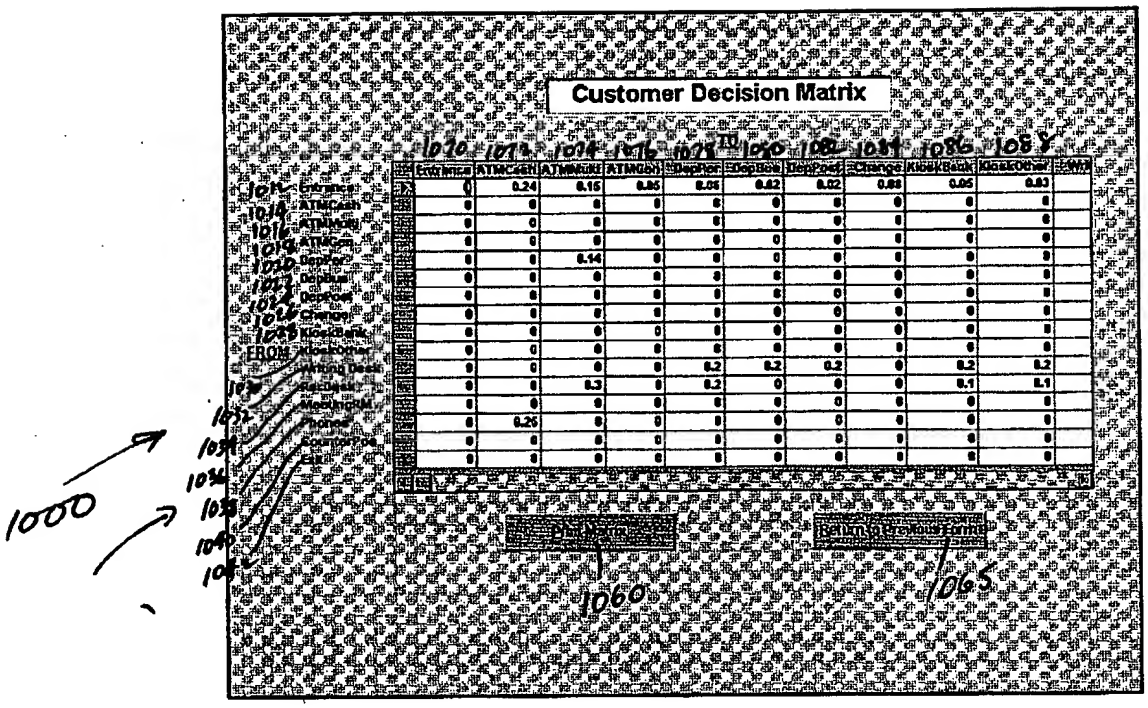

Customer Decision Matrix
1000
1060
1065

FIG. 10

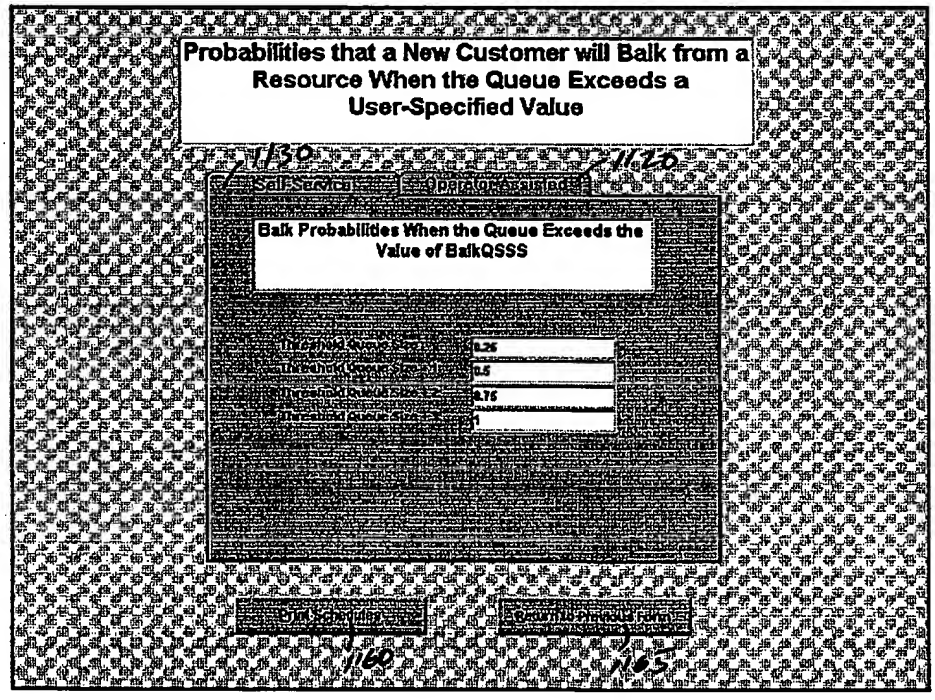
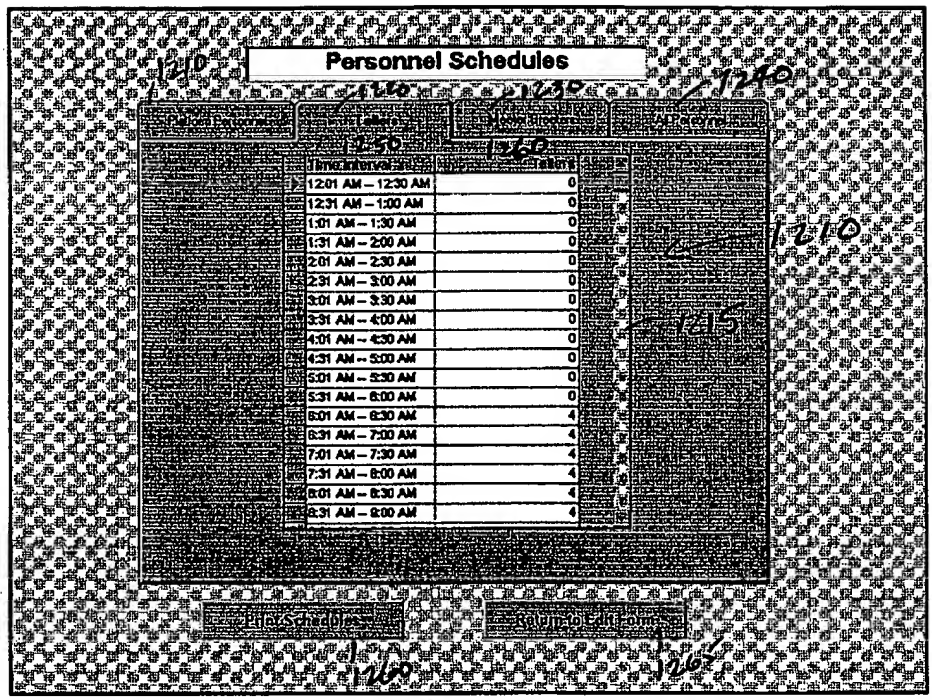
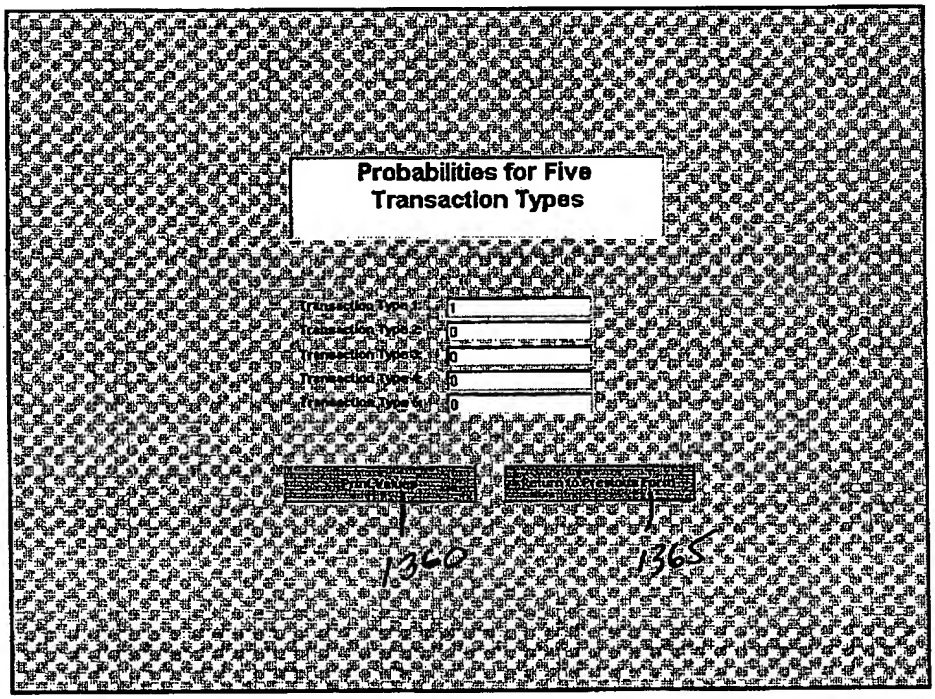

Probabilities that a New Customer will Balk from a Resource When the Queue Exceeds a User-Specified Value
Balk Probabilities When the Queue Exceeds the Value of BalkQSSS
1130
1120
1160
1165

FIG. 11



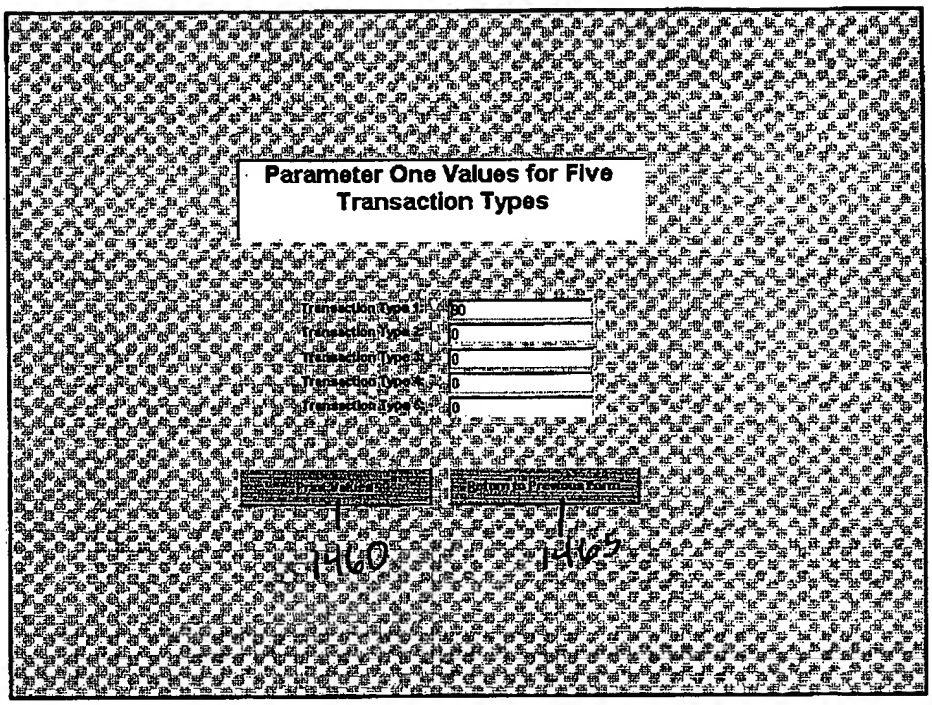
1200

FIG. 12



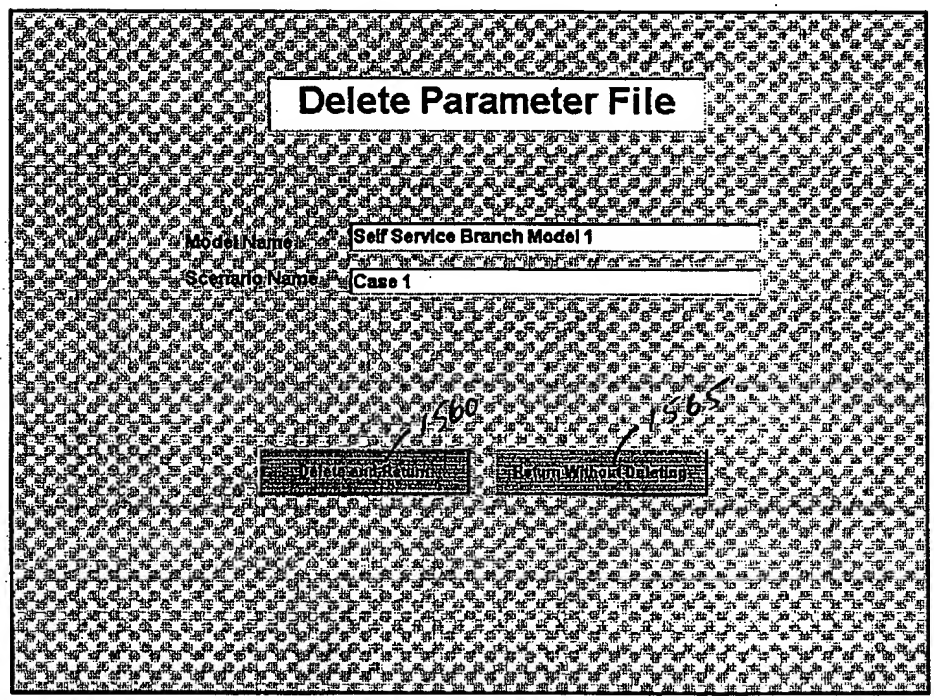
1300

FIG. 13



1400

FIG. 14



1500

FIG. 15

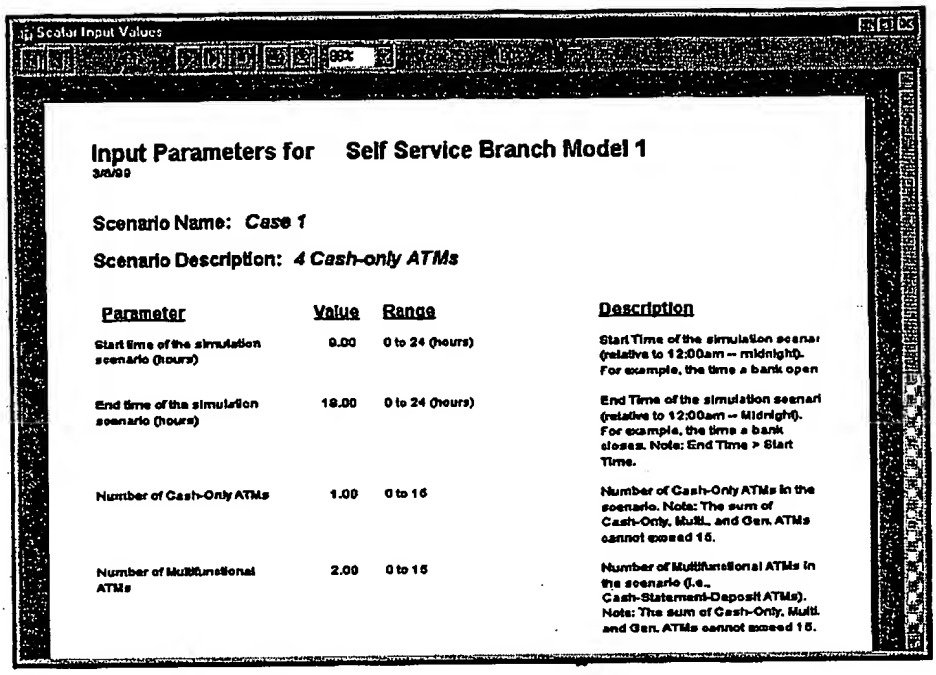

Scalar Input Values
Input Parameters for Self Service Branch Model 1
3/5/99
Scenario Name: Case 1
Scenario Description: 4 Cash-only ATMs
Parameter
Value
Range
Description
Start time of the simulation scenario (hours)
0.00
0 to 24 (hours)
Start Time of the simulation scenar (relative to 12:00am -- midnight). For example, the time a bank open
End time of the simulation scenario (hours)
18.00
0 to 24 (hours)
End Time of the simulation scenari (relative to 12:00am -- Midnight). For example, the time a bank closes. Note: End Time > Start Time.
Number of Cash-Only ATMs
1.00
0 to 15
Number of Cash-Only ATMs in the scenario. Note: The sum of Cash-Only, Multi., and Gen. ATMs cannot exceed 15.
Number of Multifunctional ATMs
2.00
0 to 15
Number of Multifunctional ATMs in the scenario (i.e., Cash-Statement-Deposit ATMs). Note: The sum of Cash-Only, Multi. and Gen. ATMs cannot exceed 15.
1600

FIG. 16

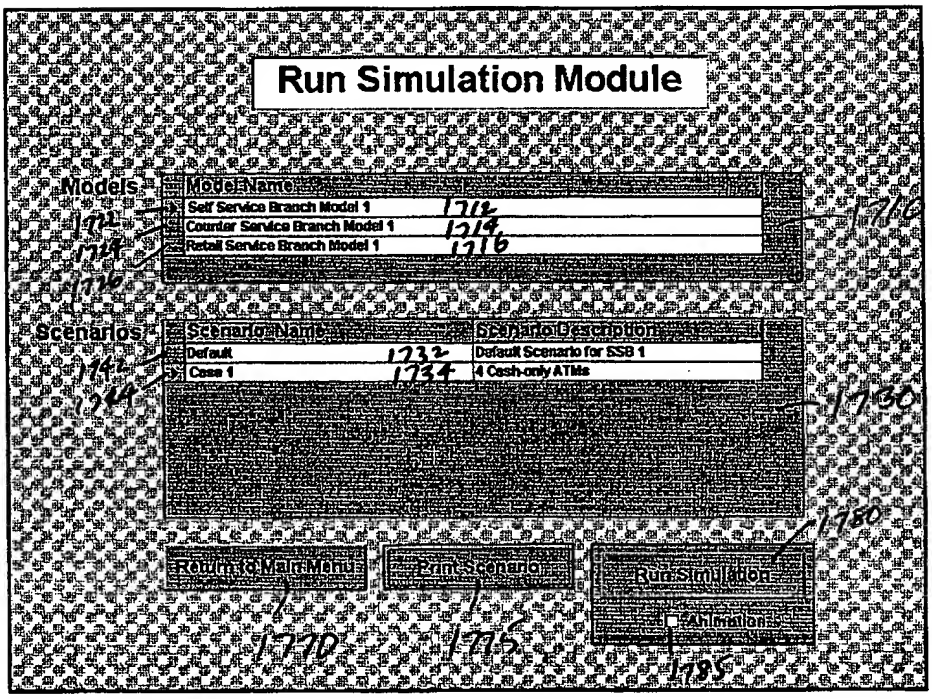

Run Simulation Module
Models
Model Name
Self Service Branch Model 1
Counter Service Branch Model 1
Retail Service Branch Model 1
1712
1714
1716
1710
1712
1714
1716
Scenarios
Scenario Name
Scenario Description
Default
Case 1
Default Scenario for SSB 1
4 Cash-only ATMs
1732
1734
1730
1742
1744
1700
Return to Main Menu
Print Scenario
Run Simulation
Animation
1780
1770
1775
1785

FIG. 17

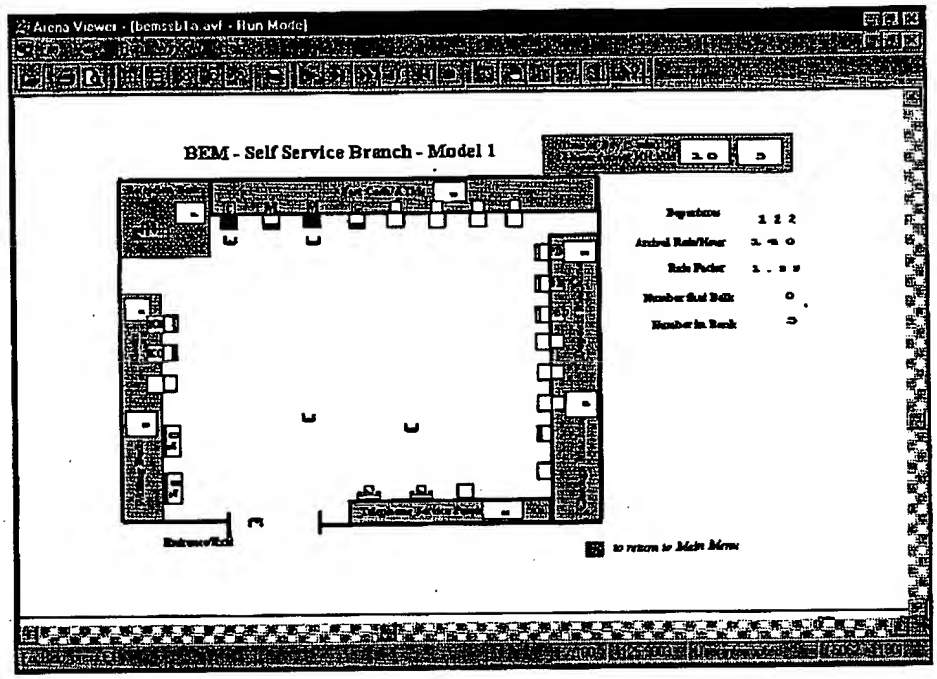

Arena Viewer - [bemssb1a.avi - Run Mode]
BEM - Self Service Branch - Model 1

FIG. 18

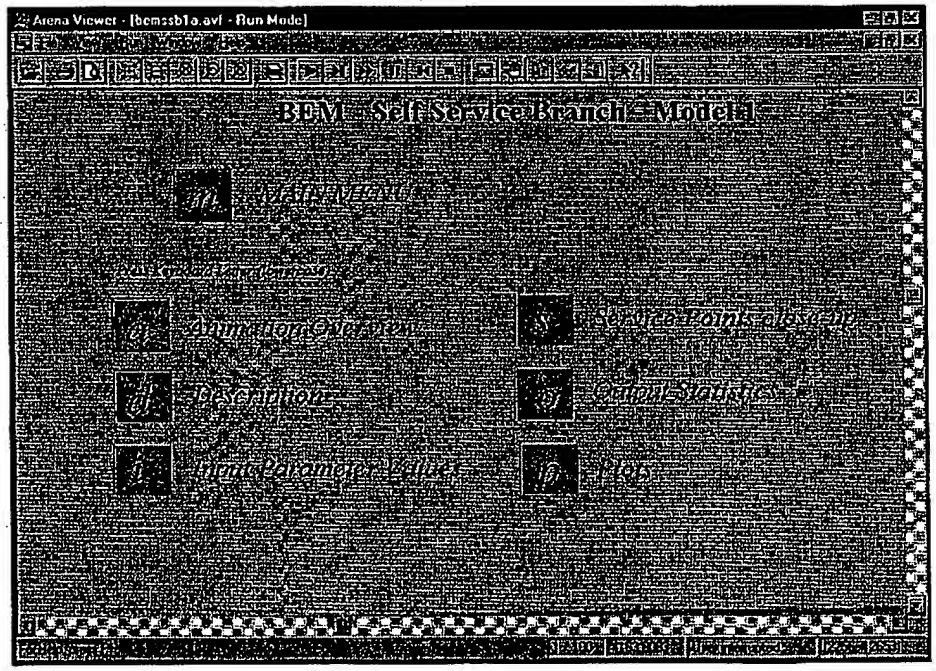

Arena Viewer - [bemssb1a.avi - Run Mode]
BEM - Self Service Branch - Model 1

FIG. 19

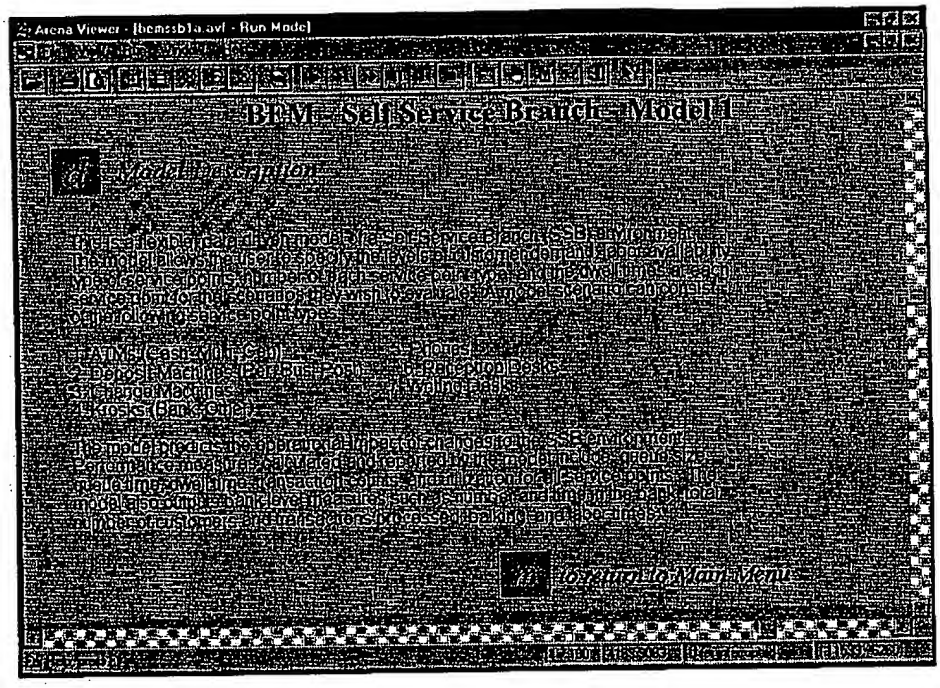

Arena Viewer - [bomssb1a.avi - Run Mode]
BOM - Self Service Branch - Model 1
Model Information
Return to Main Menu

FIG. 20

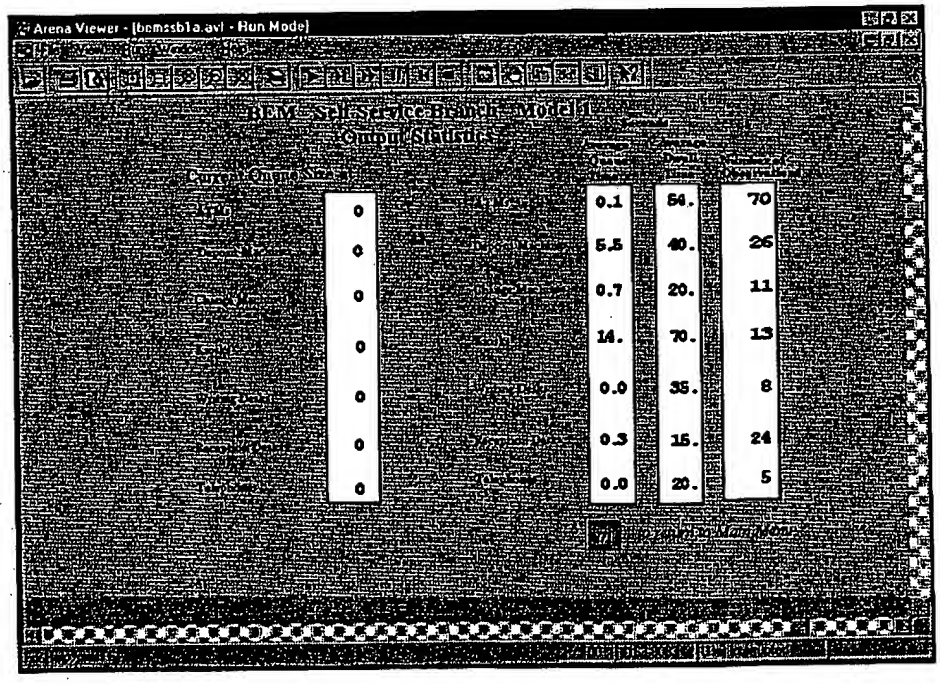

Arena Viewer - [bomssb1a.avi - Run Mode]
BOM - Self Service Branch - Model 1
Output Statistics
0.1
5.5
0.7
14.
0.0
0.3
0.0
54.
40.
20.
70.
35.
15.
20.
70
26
11
13
8
24
5

FIG. 21

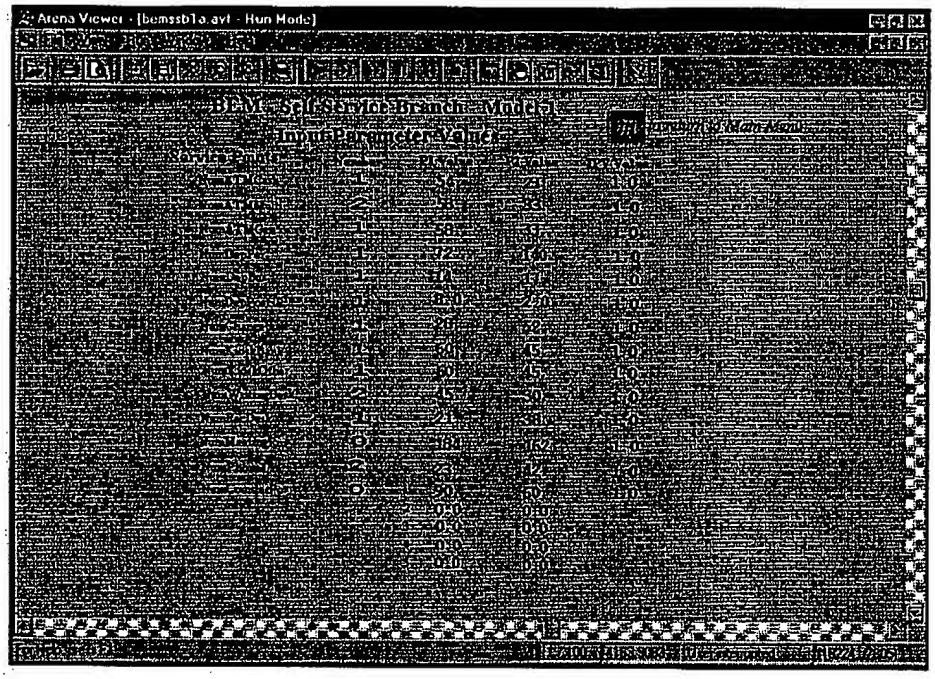

Arena Viewer - [bemssb1a.avl - Run Mode]
BEMS Self Service Branch - Model 1
Input Parameter Values
Go to Main Menu

FIG. 22

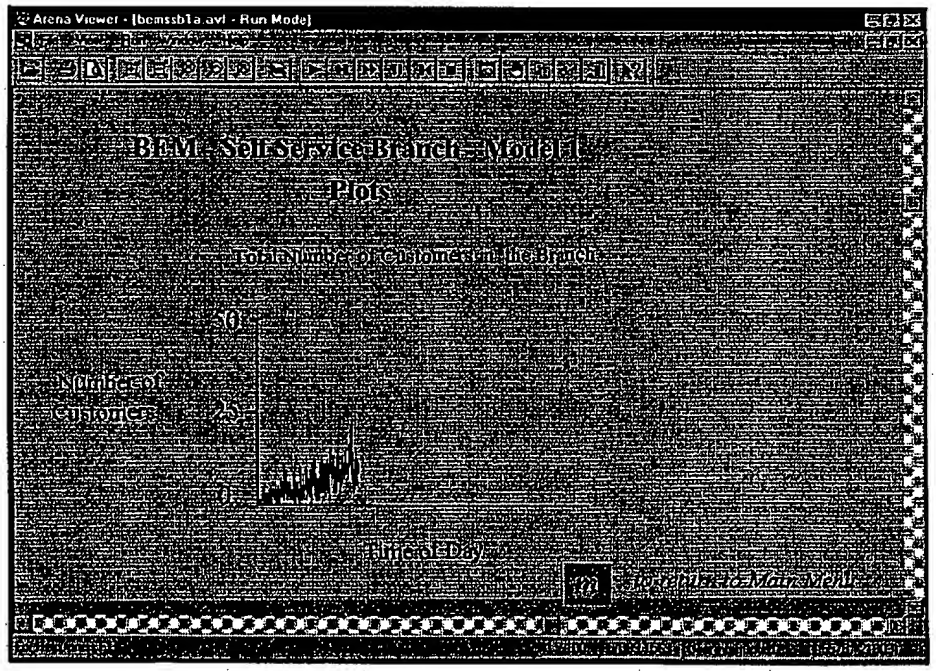

Arena Viewer - [bemssb1a.avl - Run Mode]
BEMS Self Service Branch - Model 1
Plots
Total Number of Customers in the Branch
Number of Customers
Time of Day
Go to Link to Main Menu

FIG. 23

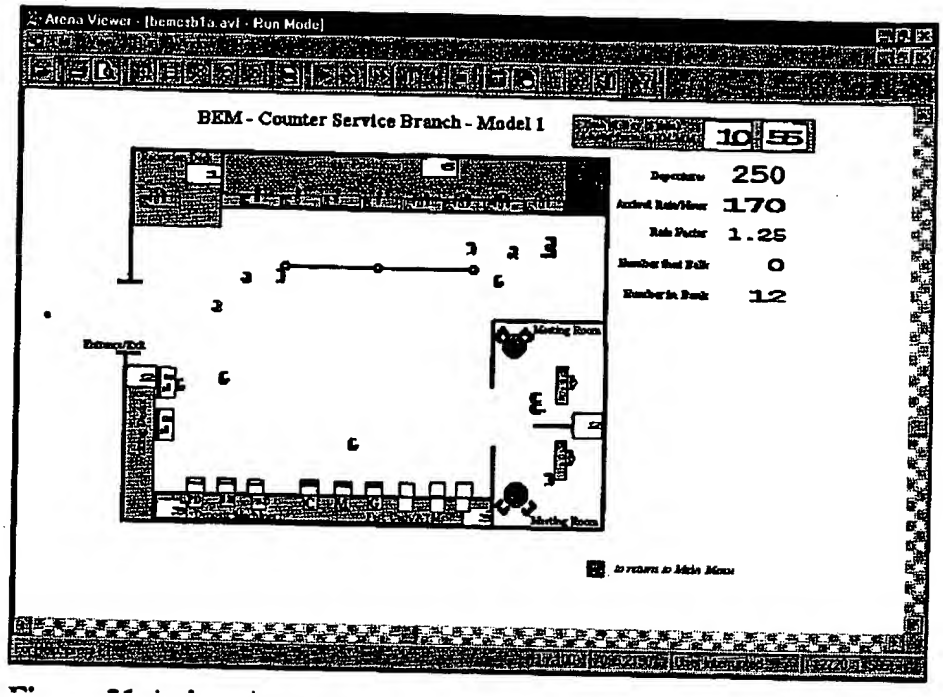

Arena Viewer - [bemcsb1a.avt - Run Mode]
BEM - Counter Service Branch - Model 1
10 55
250
170
1.25
0
12
Meeting Room
Meeting Room

FIG. 24

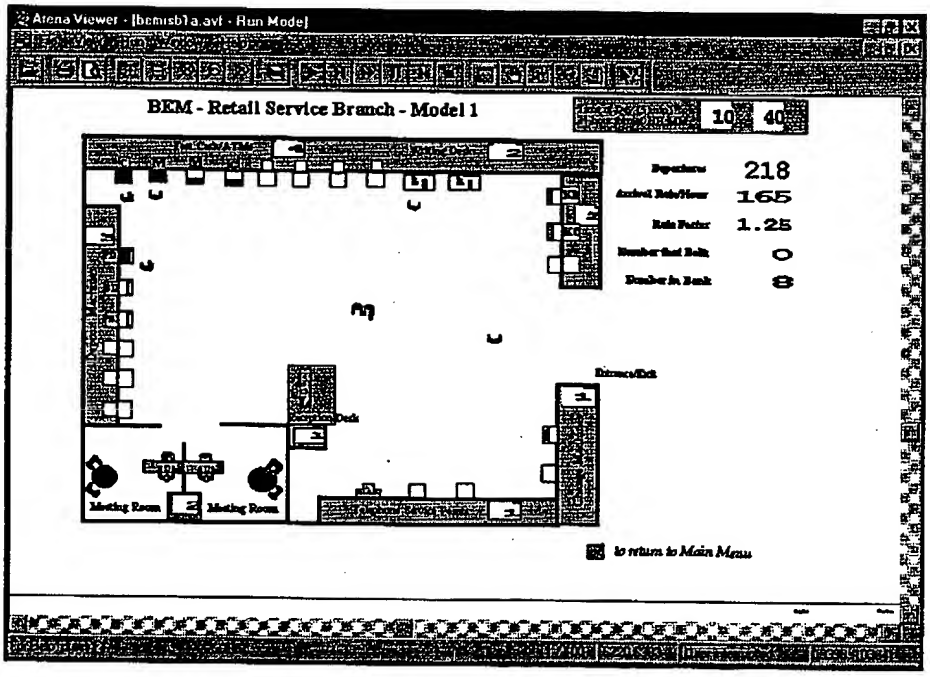

Arena Viewer - [bemrsb1a.avt - Run Mode]
BEM - Retail Service Branch - Model 1
10 40
218
165
1.25
0
8
Meeting Room
Meeting Room

FIG. 25

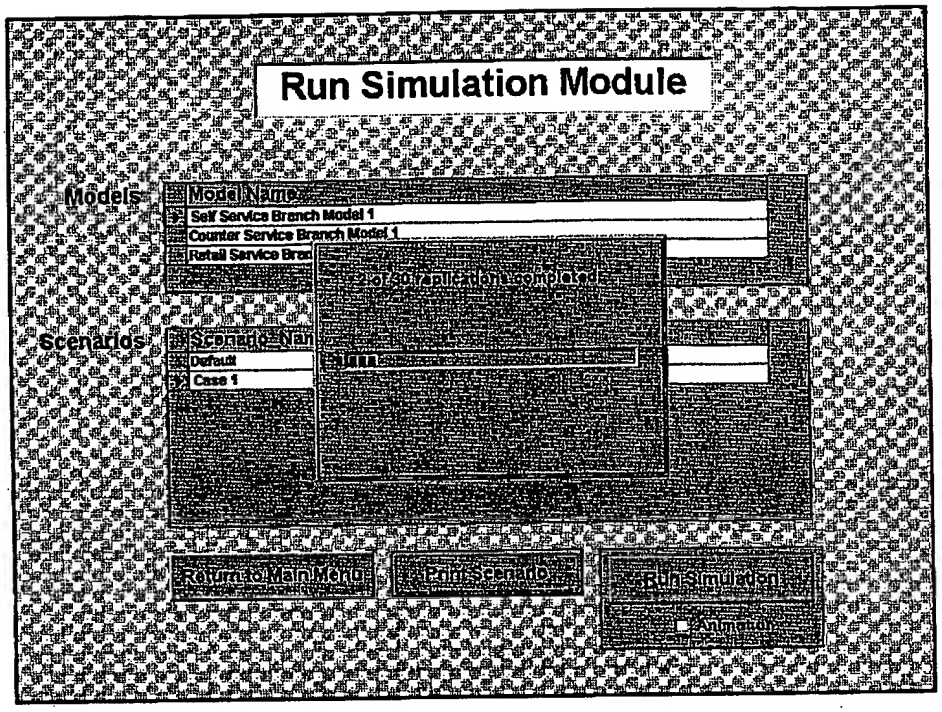

Run Simulation Module
Models
Model Name
Self Service Branch Model 1
Counter Service Branch Model 1
Retail Service Brac
Scenarios
Scenario Nan
Default
Case 1
Return to Main Menu
Print Scenario
Run Simulation
Animation

FIG. 26

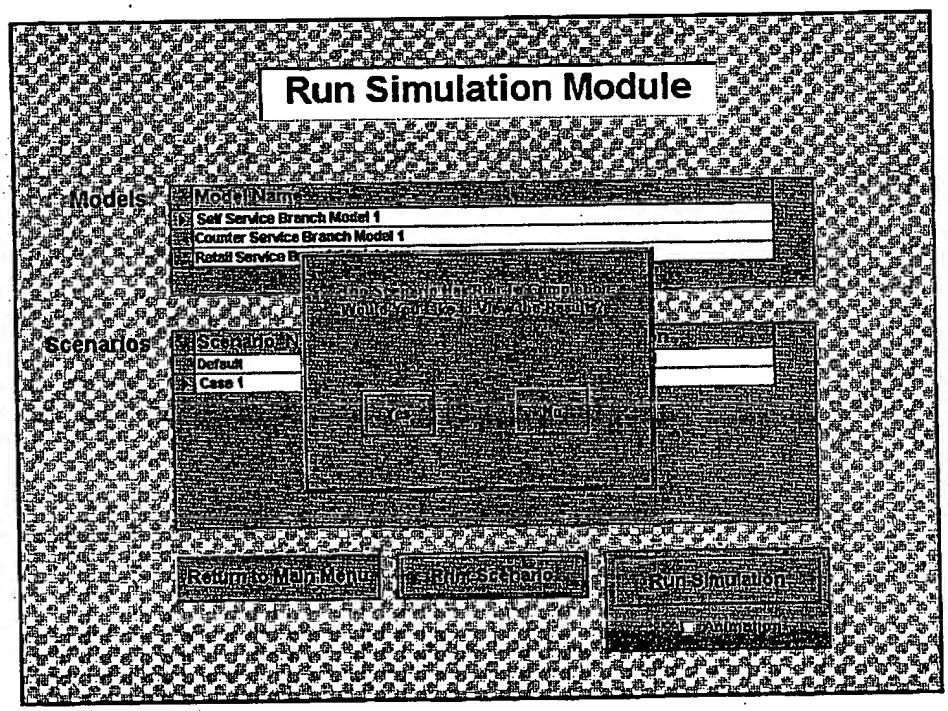

Run Simulation Module
Models
Model Name
Self Service Branch Model 1
Counter Service Branch Model 1
Retail Service Br
Scenarios
Scenario Name
Default
Case 1
Return to Main Menu
Print Scenario
Run Simulation

FIG. 27

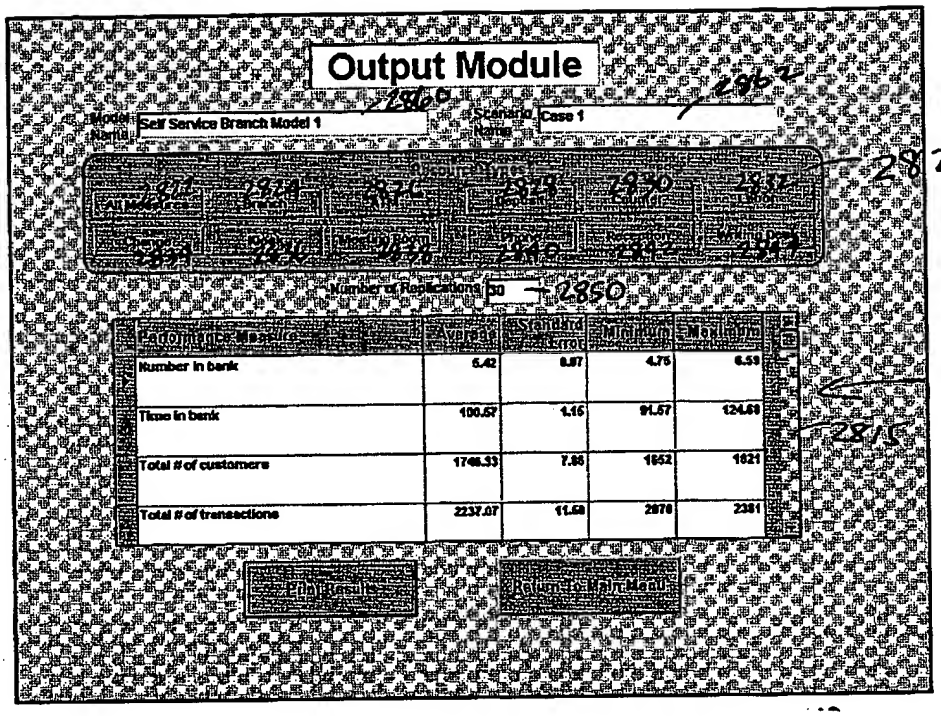

Output Module
2860
2862
Model Name: Self Service Branch Model 1
Scenario Name: Case 1
2820
Number of Replications: 50
2850
Performance Measure
Average
Standard Error
Minimum
Maximum
Number in bank
6.42
0.07
4.75
8.53
Time in bank
100.57
1.15
91.57
124.68
Total # of customers
1748.33
7.85
1652
1821
Total # of transactions
2237.07
11.58
2078
2381
2810
2815
Run Results
Return to Main Menu

FIG. 28

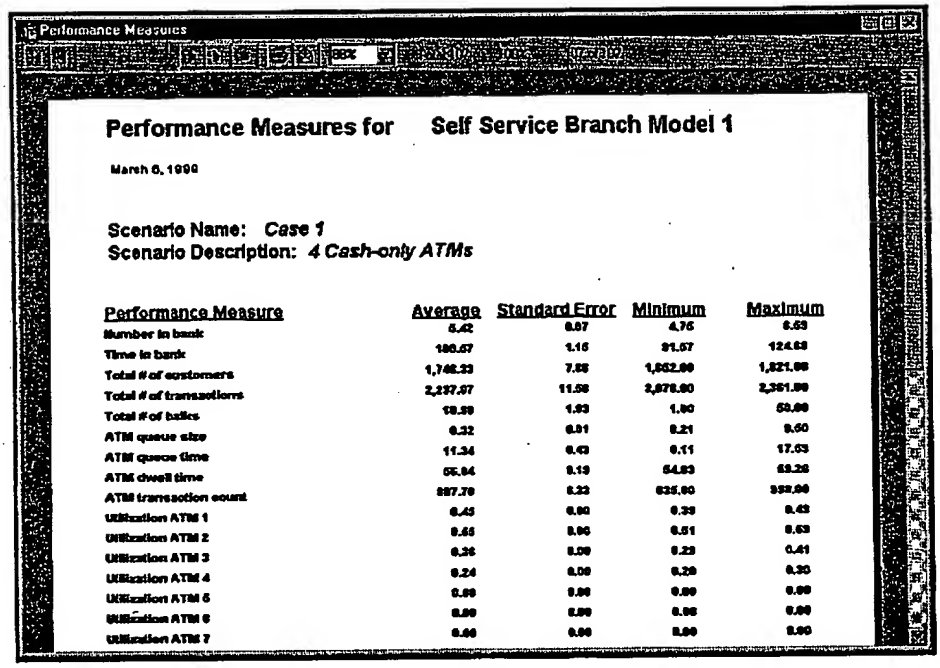

Performance Measures
Performance Measures for Self Service Branch Model 1
March 6, 1999
Scenario Name: Case 1
Scenario Description: 4 Cash-only ATMs
Performance Measure
Average
Standard Error
Minimum
Maximum
Number in bank
6.42
0.07
4.75
8.53
Time in bank
100.57
1.15
91.57
124.68
Total # of customers
1,748.33
7.85
1,652.00
1,821.00
Total # of transactions
2,237.07
11.58
2,078.00
2,381.00
Total # of balks
18.89
1.93
1.00
50.00
ATM queue size
0.22
0.01
0.21
0.50
ATM queue time
11.34
0.43
0.11
17.53
ATM dwell time
55.84
0.13
54.83
59.26
ATM transaction count
557.70
0.22
535.00
559.00
Utilization ATM 1
0.43
0.00
0.39
0.43
Utilization ATM 2
0.55
0.00
0.51
0.53
Utilization ATM 3
0.26
0.00
0.23
0.41
Utilization ATM 4
0.24
0.00
0.20
0.30
Utilization ATM 5
0.00
0.00
0.00
0.00
Utilization ATM 6
0.00
0.00
0.00
0.00
Utilization ATM 7
0.00
0.00
0.00
0.00

FIG. 29

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APPLICATION NUMBER	FILING DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	DRAWINGS	TOT CLAIMS	IND CLAIMS
09/653,196	08/31/2000	2123	948	8320.10	22	26	1

CONFIRMATION NO. 4698

CORRECTED FILING RECEIPT

OC000000005970032

Paul W Martin Esq
Senior Attorney
NCR Corporation
101 West Schantz Avenue
Dayton, OH 45479-0001

Date Mailed: 04/16/2001

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Applicant(s)

Charles R. Cash, New Albany, OH;
William Douglas Poynter, Duluth, GA;

Domestic Priority data as claimed by applicant

THIS APPLN CLAIMS BENEFIT OF 60/151,629 08/31/1999 *
(*) Data inconsistent with PTO records.

Foreign Applications

If Required, Foreign Filing License Granted 10/17/2000

Projected Publication Date: N/A

Non-Publication Request: No

Early Publication Request: No

Title

Lane and front-end effectiveness model

Preliminary Class

703

Data entry by : JAY, MARION **Team :** PCT **Date:** 04/16/2001

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